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LIVE-STOCK AND POULTRY
DISEASES

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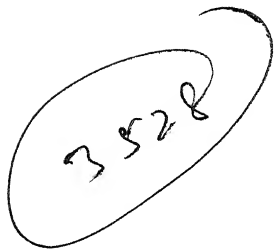
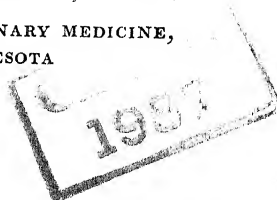
LIVE-STOCK AND POULTRY DISEASES

In Five Parts

BY

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PREFACE

THIS volume is not intended to be a veterinary encyclopedia. Only those diseases commonly encountered on the farm are included. The advice is not meant to take the place of competent veterinary service, but rather to emphasize its importance and at the same time to place in the hands of the reader up-to-date information on his various disease problems in language he can understand. An attempt has been made to present the subject in a popular way and to avoid the use of all technical terms. There seems to be no good reason why instruction in this subject should not be made easily readable as well as accurate. When necessary, simple methods of first aid are outlined, and specific sanitation against contagious and parasitic diseases is carefully described.

The author wishes to acknowledge the use of material from all available sources, such as veterinary text-books, periodicals, experiment station and federal publications. No attempt is made to refer to each by special reference. With few exceptions, all the illustrations are by permission of the Minnesota Experiment Station. The use of these is made possible by courtesy of the heads of the Veterinary, Animal Husbandry, and Dairy departments. The writer wishes to thank Drs. C. P. Fitch, W. L. Boyd, and H. C. Kernkamp for helpful advice and counsel.

W. A. BILLINGS.

Saint Paul, Minnesota,
January, 1930.

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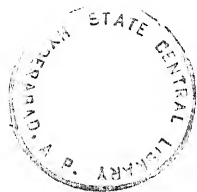
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**LIVE-STOCK AND POULTRY
DISEASES**



LIVE-STOCK AND POULTRY DISEASES

CHAPTER I

HOW SANITATION MAY PREVENT LIVE-STOCK DISEASES

ANYONE on the farm will admit that if it were not for losses from disease, the business of raising live-stock would be much more pleasant and certainly more profitable. Disease in farm live-stock is always disastrous. It affects the farm finances most, but may reduce the morale of the entire household. An epidemic of disease always leaves a trail of discouragement. Let us, for a moment, investigate the situation and see where the trouble really lies.

A cow with indigestion may be a cause for worry, a brood sow in trouble at farrowing time may lose her entire litter, a horse with a colic may mean an all-night vigil in the stable, a sheep may die of bloat after a busy day in the pasture, and a chicken or two may die of phosphorous poisoning after eating a few match heads. Any one of these events might happen on any well-ordered farm, but no farmer's success was ever jeopardized by the occasional loss of an animal. If one had only such problems to contend with, live-stock raising would be easy.

Real losses and discouragement come quite differently. For example, a dairyman may spend the better part of his life getting together an excellent herd of milk cows, only to lose them after a two- or three-year battle with tuberculosis

or contagious abortion. A swine-grower may see his years of effort disappear in a few weeks after an epidemic of hog cholera. An entire flock of sheep may be rendered unprofitable or even destroyed by the stomach worm. The flock of poultry may become infected with tuberculosis. This list could be continued indefinitely. It is this sort of trouble which often makes stock-raising a gamble. Tuberculosis, contagious abortion, and hog cholera are incurable. Parasites of sheep are better dodged than treated. In this book the disease question will be approached with a different viewpoint. More space will be devoted to the common sense control of the more important diseases that make farming unprofitable. Quack remedies will be noticeably absent and not many prescriptions will be offered. In short, an attempt will be made to put sanitation to work in a practical way.

First, some of the old superstitions concerning the origin of disease must be eliminated. Even in this day and age many persons still cling to the old theory that disease germs arise by spontaneous generation; of course, this is pure fiction. In the animal world there are many distinct diseases and each is produced by its specific germ. One disease does not turn into another. The particular germ for this or that disease must actually be there before the diseases can start. One is frequently asked this question— if disease germs do not originate from unclean conditions but are merely the descendants of parent germs, where did the first germs come from? All this may be food for speculation and discussion, but no one should refuse to accept the germ theory of disease on this account. Only a short time ago the writer was called on to prescribe treatment for a cow with a wolf in the tail and for another one that had lost its cud. Many farmers do not accept the fact that worms in swine develop from eggs and that small pigs should be guarded to prevent them from coming in contact with these worm eggs. Filth necessarily means dangerous living conditions, but this alone does not generate disease.

It simply means that under such unfavorable conditions, germs are more likely to be found.

At present there is considerable talk about disease prevention in live-stock. Linked with this, farmers are urged to practice sanitation in connection with the health of farm animals. The term sanitation may seem hazy to many men on the farm. Most of them would rather have some medicine instead. Many have heard of the McClean County system of swine sanitation, which is a simple method of preventing pigs from becoming full of round-worms. Farmers have been trying to fight round-worms in swine for twenty years with pills and powders of all sorts. The problem is more serious now than when they started. They are beginning to realize the importance of a clear understanding of the disease at hand and then, if possible, to develop a definite plan whereby losses may be kept down to a minimum. For example, if a disease such as tuberculosis attacks the farm flock of chickens, one should not try to cure the individual bird. It will be far better to set up some kind of a plan or system that will enable one to get rid of those already infected and then prevent the remainder from becoming affected.

In all discussions of disease control, the part played by sanitation arises. As Van Ess, of Nebraska, has aptly put it, "Sanitation consists merely in the establishment and maintenance of surroundings fit and safe for animals to live in." To go still further, the prevention of disease depends on sound live-stock, correct and adequate feeding methods, good sanitation, and the eradication and control of contagious diseases. It is not easy to accomplish all this, even though it may sound simple. To carry out a definite plan of sanitation against any disease is hard work and may call for a lot more effort than the owner feels able to put into it. For this reason it is often a great temptation to overlook certain necessary steps and cut corners. Cutting corners always spells failure. A true story will illustrate this tendency to dodge the issue. Most farmers

have trouble with flies bothering the dairy herd in summer. Various means have been tried to relieve the situation. None has been especially successful. This leaves the dairyman in a very receptive mood and he is offered a sure preventive in the form of what is called fly salt. If cows are allowed free access to this salt for a month or so before they go on pasture in the summer, no flies will molest them. Good common sense should dictate otherwise, but this method offers an easy and guaranteed way of relief. For the same reasons it has been the practice of swine-growers for generations to resort to various drugs and preparations that are designed to prevent disease, simply by mixing them in the feed or slop. While this system may be easy it is also worthless. Good sanitary practices are not easy. Almost all of them call for a reversal of ordinary live-stock practices, and for this reason are not always welcomed.

It is well to remember that most of the common contagious diseases of live-stock are incurable in the sense that an animal can be cured after it has become sick. In this class might be included tuberculosis, anthrax, and blackleg of cattle. Tuberculosis should be controlled, not by an attempt to cure the individual animal, but by first testing the entire herd and then slaughtering all those affected. This applies to anthrax also, in that control methods are practical only by vaccinating the healthy animals, so that they will not become infected. Preventive vaccination is also used in the control of blackleg and hog cholera. There is no vaccine for tuberculosis.

Sanitation might be divided into two kinds, general and specific. By general sanitation is meant the attempt to keep the feed, water, air, barns, yards, and soil as clean as possible. This might be called shot-gun sanitation, because it is not directed against any special disease. It will, at least, promote better living conditions. It will not control a contagious disease, however, because certain important avenues for the germs to enter may be over-

looked, unless the nature of the disease is known and how it is spread. This would permit the disease to continue. To illustrate, tick fever is a common disease in the southern states. It affects cattle and is transmitted by the bite of a tick. One might scrub the barn, disinfect the feeding and drinking utensils, and sprinkle lime on the soil of the barnyard, but this would not help. The problem is to get rid of the ticks. This is done by dipping all cattle in the tick-infected territory. General sanitation will not control tuberculosis; all the animals responsible for spreading the germs must be removed from the herd. General sanitation is good; it increases one's self-respect and makes the premises look better and more attractive. One should never try to disinfect the hog lot, cow lot, or chicken yard by sprinkling lime or other chemicals on the soil; it is a pure waste of time. Nature and sunshine will do a much better job. Instead, one should move off the old yard to a new one and give nature a chance to clean up.

Specific sanitation is the important method of combating disease. One should first determine the nature of the disease, learn the cause, find out how it is spread, learn how the germs enter the healthy animal's body, and then, armed with this information, set out to block the way and prevent further losses. In order to control and stamp out an outbreak of tuberculosis in cattle, one must know that the germs of the disease enter the body of the healthy animal through the mouth by means of food and water. Cows often have the lung form of tuberculosis. This makes it very easy for the germs to pass out through the mouth when the animal coughs and thus serves to infect the feeding floor and the water supply. To counteract this, special care should be taken to keep the drinking utensils or cups and the feeding floor clean. This is much more important than a coat of whitewash on the walls.

The present method of hog cholera control places the entire effort on prevention. There is no positive cure for the disease after an animal becomes infected. The use of

anti-hog-cholera serum and virus as a vaccine for healthy pigs will make them immune for life. This is just ordinary hog life insurance against cholera. General sanitary methods may be necessary but will not prevent this disease. There is still much to learn about hog cholera, but it is known to be contagious and that vaccination is a success if it is used before the animals become sick.

To emphasize again the need for more knowledge of diseases and the proper methods of control, swine tuberculosis may be considered. This disease has been spreading in an underhand way for many years. Until recently, everyone thought hogs received all their infection from cows, by associating with them or by drinking raw milk from infected cows with diseased udders. Much of this is true but more is now known. Recent experiments have shown definitely that the larger part of swine tuberculosis comes from association with the farm flock of chickens, which is infected with tuberculosis. To profit by this knowledge, the disease must be cleaned up in both cattle and chickens, or the pigs must be kept away from the sources of infection. This is another case in which general methods of common cleanliness would have failed.

Again, most classes of live-stock suffer from parasites. A sheep suffers from a disease commonly called grub in the head. In some sections of the United States it is very troublesome. The story goes something like this. During July and August a fly alights on the sheep's nostrils and deposits an egg or tiny grub. The grub, in turn, crawls up inside of the nose and picks out a comfortable resting place. As it crawls, it irritates the animal and causes it to act as though it had a cold in the head. In a later chapter this disease will be dealt with more at length. The point to bring home now is that here, too, a little more information will do more than a cure. There is no easy help for a sheep badly affected, but if a bit of pine tar is smeared on the animal's nostrils during the months of infection, the fly will still be around, but it does not care for the

odor of tar and consequently does not get a chance to deposit the larvæ on the sheep's nostrils.

For many years the turkey industry has been threatened with destruction by the ravages of a disease called blackhead. Persons who have lost many hundreds of dollars as a result of this disease know little or nothing about specific sanitation against blackhead. Anyone who is to engage in the business of raising turkeys should study this disease from start to finish and know at least the limit of present knowledge of its control. First, one would learn that the name is not accurate, because the turkey's head seldom turns black. He would find out that it is a disease of the digestive organs instead of the head. It affects only the liver and intestines. It is a soil-borne disease. The germs live in the soil for many months. Recent investigations show that the egg of the cæcal worm of chickens may act as a carrier and that if turkeys are fed these eggs or worms, blackhead can be produced. Therefore, to keep a flock free from this disease it would be best to grow young turkeys away from the older ones and more especially from the chickens, and on soil that has not been contaminated with the droppings of poultry.

It is hoped that one fact has been made clear: one must do more than clean up and keep clean. A general housecleaning is very well as far as it goes, but it does not go far enough. To control successfully any live-stock disease one must first know what the disease is and how it is transmitted. Only by directing sanitary efforts against it can one hope to accomplish anything. One should not worry about cures for most of the diseases of live-stock. All sanitary practices aim to stop the spread of disease. Farmers waste entirely too much time and energy looking for cures for this, that, and the other difficulty that may be bothering their animals. This constant chase for cures has made them easy prey for the peddler of all sorts of ridiculous concoctions that are designed to meet the demand. The hog-grower wastes thousands of dollars in search for the

perfect hog tonic. So far as known it has never been discovered and is not likely to be.

While one may agree that all this is true, it is well to peep behind the scenes and learn what actually takes place on many farms. A horse in the barn is suffering from colic. Instead of calling a competent veterinarian, it is often customary to have on hand a bottle of colic medicine. The owner does not know that colic is merely a pain in the region of the abdomen. This pain may be due to one of several causes. The animal's intestines may have become twisted while rolling on the ground. This is an extremely painful disease and does not call for colic medicine. In fact, that would only serve to increase the pain and discomfort. A colic or the pains of colic are nothing more than the symptoms of a number of troubles that might be easily misconstrued. It might even be a gas colic. This condition prevails in man as well as in animals. Anyone who has suffered gas pains after an abdominal operation will understand what is meant. Most colic medicines are simple active cathartics and may actually kill an animal if used improperly. A sick horse in the throes of a severe colic requires expert help and not a shot-gun prescription.

The farm wife may have a flock of chickens. They do not lay as many eggs as she thinks they should and may appear listless. One may die every now and then. All too frequently she does not know the cause of the trouble and goes to the store and buys a package of tonic. The clerk is accepted as an expert on chicken diseases, even though he may have been selling pianos the week before. This sort of procedure is pure folly. One might as well call the druggist on the telephone the next time a member of the family becomes ill and ask him to send over some medicine at once. No reputable druggist would do this. Most raisers of chickens have the notion that they must put something in the drinking water. It does not seem to matter just what it is so long as it turns the water a color good to look at. The writer does not know of a single disease of poultry

that can be cured or controlled by putting drugs in the drinking water. Perhaps Epsom salts would be an exception, but that can hardly be called a cure for anything but constipation.

For many years the grower of swine has felt the urge to feed promiscuous tonics and conditioners. This is thought to be necessary if one intends to obtain quick and profitable gains. Thousands of dollars are wasted annually that might be well spent for other things. Hogs suffer chiefly from hog cholera, necro, and worms. The standard tonic is worse than useless to cure or control any of these. In fact, they actually do positive damage, because they give the owner a false sense of security and delay the time for carrying out simple and practical methods of control. Farmers who depend on the itinerant peddler for veterinary advice are bound to pay heavily for it.

Recently, mineral feeding was introduced as a valuable aid to the proper balancing of a ration. Not satisfied with this help, claims are now being made that mineral feeding will cure and prevent many of the common diseases of cattle and hogs. This is, of course, preposterous. Some say that minerals will increase the size of the litter of pigs, even though the sow is scheduled to farrow in the next week or two. Claims are made that mineral feeding will prevent worms and necro. This is beyond all reason, and the man who tries this is doomed to disappointment.

Hardly a year passes that some new panacea is not brought out for the prevention of hog cholera and other swine diseases. It is the writer's opinion that good hogs can be raised on clean ground, free from worms and necro, without the aid of panaceas and tonics. One might continue indefinitely a recital of such practices. It suffices to say that it is simply going at the trouble blindfolded and no relief can be expected. How much better it would be to adopt such reasonable practices as those mentioned a few pages back. Then, also, the local veterinarian is there to help and should be employed whenever necessary. No matter

how expert and efficient he may be, he cannot cure pigs dying of cholera. He has no medicine that will prevent tuberculosis in live-stock. He can help many times to locate the cause of the trouble and then advise a sane and sensible plan of control. This is a new day of efficiency on the farm. The tonic era is a thing of the past, or should be.

so common. One should always watch for grayish or yellowish lumps or nodules in or upon the various organs. On the liver and spleen they may be raised above the surface, while on the lungs they may appear as buried areas of dead tissue. These areas may contain pus. On the intestines wart-like growths frequently adhere to the walls. When in doubt as to the fitness of the carcass for food, a veterinarian should always be consulted.

Control of tuberculosis

It is generally recognized that tuberculosis is incurable. Medicines are worthless. The very destructive nature of the disease makes this impossible. The rational procedure is to have the entire herd tested and then remove for slaughter all those cows which react to the test.

It is not practical for farmers or live-stock men to do the testing themselves. Wherever this was done, the results were disastrous. The test is a delicate one and requires skill. It is best performed by licensed veterinarians under the direct supervision of the various state live-stock sanitary boards. The test is accurate and there is no good reason for distrusting it. It does not affect the milk-flow or cause pregnant animals to abort. It will not injure an animal in any way. One often hears stories as to the nature of the tuberculin used in the test. Tuberculin cannot make an animal contract tuberculosis. It does not contain any germ, either alive or dead, of this or any other disease. Tuberculin as usually prepared is a liquid. It is made by growing the germ of tuberculosis on prepared beef broth in an incubator for a sufficient time to saturate the liquid with the products from the growth of the germs. This liquid is then boiled and carefully filtered. A small amount of carbolic acid is added to preserve it. The tuberculin test is the best method available to determine the presence of the disease, even though it is in the early stages and long before visible symptoms are noted. If an animal, into which it is injected, has tuberculosis in the slightest degree

a reaction follows. This reaction is definite and nothing is left to the imagination.

Three varieties of the test have been used, the ophthalmic or eye test, the subcutaneous or temperature test, and the intradermal or skin test. The ophthalmic or eye test is sometimes employed as a check test to verify one of the others. The subcutaneous test was once in general use, but has been displaced in favor of the intradermal. The temperature test was time-consuming and did not permit of rapid testing. A series of temperatures were taken before and after the injection of the tuberculin. A definite rise in temperature after the injection was considered a reaction. When the intradermal test is used, many animals can be tested by one man in a day and it is fully as accurate as any of the others. It is fast and has come to be accepted as the standard test. With the use of a special needle, a small amount of tuberculin is injected into the thin skin at the base of the tail. The entire herd is injected at the same time. Some hours later the herd is again examined and all those animals which show a definite swelling at the point of injection are considered to be reactors and condemned. In many states the reactors are branded to prevent resale. Many herd owners find it difficult to accept the results of the test, because it often happens that the fattest steer or the heaviest milker reacts. The ability of the test to select the infected animals seems uncanny, and the owner may feel that there is an organized attempt on the part of some one to deprive him of his best animals. This is far from true. The owner, more than anyone else, should want to remove these reacting animals from his herd, for they seldom recover and are always a source of danger both to the healthy members of the herd and to members of his family. The tuberculin test is the best and surest way for a farmer to free his herd from this plague. After a herd is tested no animals should be introduced into it unless they have passed a satisfactory test. The test will have no ill effects upon the breeding efficiency of the

herd. Ninety per cent of the reacting animals will show definite lesions of the disease when they reach the slaughter-house. The other 10 per cent are surely affected, but the spot or lesion in them may be so small as to escape detection.

Many states are now organized to promote the wholesale eradication of tuberculosis by what is commonly known as the Area Test Plan. It was formerly the practice for some farmers, who were especially interested, to cooperate with the state and federal authorities in securing what was known as an accredited herd free from tuberculosis. This plan worked very well for a starter, but it was found to be slow in action and was not securing the desired results. It did not seem practical for one man to clean up the disease in his herd and find all his immediate neighbors with infected herds. With the growing interest on the part of the general public, many state legislatures now appropriate large sums of money for the control of tuberculosis. This, with the cooperation of the state and federal government and the counties concerned, has made it possible for county-wide testing. By this method, all the cattle in the county are tested at once, instead of a herd here and there. In many states the owner is paid a certain sum of money for the condemned animals. This is called an indemnity for any losses he may suffer. It is not the full value of an animal, but shows a desire on the part of the government to pay its share of the farmer's loss. After a county has passed through the required number of preliminary tests and the percentage of infection has been reduced to such a figure as one-half of one per cent, it is declared to be an accredited county. This method bids fair to bring this dreaded disease within reasonable bounds even though it does not wipe it out entirely. Its use spells progress and it merits the enthusiastic support of all progressive live-stock growers. It goes without saying that after a herd has been tested, clean-up methods should be instituted. The barn should be given a general cleaning. Especial care should be taken

to see that all drinking and feeding utensils are thoroughly disinfected. The feed alley should be scrubbed and maintained in a clean condition. Accumulated manure piles should be removed and the floor of the barn scraped and cleansed.

CONTAGIOUS ABORTION OF CATTLE

Contagious abortion affects various farm animals, including swine and sheep, but only cattle will be considered in this chapter. Abortion disease exists wherever cows are raised. The losses are greatest in the dairy breeds, but its occurrence appears to be increasing among beef cattle. No disease of cattle presents so great a puzzle to the farmer and surely none causes greater anxiety and discouragement. The trouble usually comes out of a clear sky and strikes a herd which is apparently healthy. Few animals die. The losses are largely confined to a diminished calf crop, together with a large number of animals which are either very difficult to re-breed or totally sterile. To obtain a good idea of the disease one must consider the entire picture of the premature expulsion of a fetus, retained afterbirths, and subsequently barren cows. Epidemics of calf scours and pneumonia are sometimes associated with this disease. The whole train of events mentioned above will give the reader an idea of the situation in many herds. An outbreak of contagious abortion has been likened to a storm. It begins mildly enough the first season, with the loss of two or three calves. The next year the abortions may increase until all the calves are lost. Along with this there is considerable trouble with cows that fail to clean properly. Other animals may be difficult to settle with calf. After this, the losses may decrease for the next year or two and then everything may go smoothly until the next epidemic shows itself. While all this is taking place, the owner is the loser by the number of aborted calves and the resulting large percentage of barren cows. There is also a decrease in milk production.

It is said that abortions may occur from other causes. This may be true. An animal may slip on the doorstep and abort from the resulting injury, but this should not be grounds for alarm, because it does not happen often enough. Deficient mineral supply has been blamed for some abortions. This is doubtful. An accidental abortion now and then should not bother any stockman. While it is true that some abortions may occur as a result of infection with other germs, infectious abortion, caused by *Bacillus abortus*, is the real problem.

Man is sometimes infected with the germ of abortion disease. It causes a fever often referred to as undulant fever. Infection may take place from the consumption of milk containing the germs or from the handling of animals affected with abortion disease.

Cause

Contagious or infectious abortion is a disease caused by a specific germ. This germ was discovered by Bang, a Danish scientist, and is called *Bacillus abortus*. His work has been verified many times by reliable investigators in this and other countries. There is no reason for doubt. The discovery of the cause of any disease is always an important step toward its ultimate control. Until this time almost anything imaginable was thought to be the cause. Certain investigations have been tried to prove that feeds may have a bearing on the disease. These were especially directed against breeding difficulties. The abortion germ is generally believed to enter the animal through the mouth. This comes through eating food or drinking water soiled with the discharges from aborting animals. After the germ gains entrance to the body, it seeks out the pregnant uterus or womb and multiplies there. Its growth eventually brings about a diseased condition of the membrane surrounding the growing fetus. If the infection is severe, an abortion may follow. After an abortion takes place, the live germs are likely to be present in the discharges from the affected

animal. A cow at this time is dangerous to the remainder of the herd and should be kept by herself. When this happens in the pasture and remains unobserved by the owner, it is easy to see how other animals may become infected from licking the discharged material. At times, the germs are found in the milk. Most of the common methods of disinfection will kill the abortion germ.

Contagious abortion is most common in heifers, but may be observed in older cows. After one or two abortions an animal may become permanently sterile or may give birth to several apparently normal calves. No breed of cattle is more susceptible to the disease than another. The bull is not considered an important factor in transmitting the disease to healthy cows.

Symptoms

No one knows exactly how long it takes to produce an abortion after an animal becomes infected. It may be any time from several weeks to several months. Usually the first thing a farmer notices is a calf born before full term. The calf is usually dead. If the animal in question was under close observation, she might show the usual signs of an approaching normal parturition. The udder may increase in size, and the external organs may swell and exude a brownish discharge. This may take place at almost any time. Animals may abort at such an early period in pregnancy as to pass unnoticed and the aborted fetus remain undiscovered. The reappearance of heat may be the first indication that an abortion has taken place.

The premature passage of a dead fetus may be regarded as the first symptom of abortion disease. Another common symptom is retained afterbirth. This is frequent in herds known to be affected with the disease. In abortions which occur in the early stages of pregnancy, the fetal membranes are more likely to be discharged along with the fetus. In abortions which occur late in the gestation period, the membranes may fail to be expelled naturally. If these

membranes do not pass out promptly, they should be removed. This is best done by an experienced veterinarian, because it is a rather delicate operation and great harm may be done if extreme care is not exercised. Retained afterbirths are a frequent cause of death or permanent sterility. This is due to a severe inflammation of the uterus which may become persistent or chronic. It is well to remember that a retained afterbirth is not in itself a sure sign of contagious abortion. It is often seen in cows not affected. This is probably due to the intensive methods practiced by present-day breeders. However, it is one of a train of various symptoms and should be given consideration.

Failure to breed successfully is still another symptom. While this alone is not an exact indication of infection, it is often seen in aborting herds. Animals which have a persistent discharge and repeated heat periods are likely to become barren. To sum up, it might be well to suspect that a herd which has experienced one or more abortions, together with several retained placentas and difficult re-breeding, is infected with contagious abortion.

A study of the breeding history of a herd, together with the symptoms shown during the outbreak, should enable one to be reasonably sure of the diagnosis. The fact that several heifers have aborted is often sufficient. Even though other causes may bring about an occasional abortion, one should not lose sight of the fact that by far the greatest number of abortions are of an infectious nature and not due to accidents, improper feeding, moldy feeds, lack of minerals, and the like. The only remaining procedure necessary to make sure of the disease is a laboratory examination of an aborted fetus and a blood test of the entire herd. Two types of blood tests are used. One is known as the agglutination test and the other is the complement-fixation test. The first is generally recognized as the most accurate. Both tests are strictly laboratory procedures and require extreme skill. The blood samples are

secured by drawing about one-half ounce of blood from the jugular vein. The drawing of the blood looks simple but is best left to the experienced operator. It is very doubtful whether the average man on the farm would be able to secure the samples. The blood is drawn in sterile bottles and mailed to a laboratory where the test is completed. The agglutination test is a reliable aid in the diagnosis and eradication of contagious abortion from a dairy herd.

Treatment

Before the true cause of contagious abortion was known, it was customary to attempt the treatment of cows affected with this disease. The reader is doubtless familiar with the early attempts by means of methylene blue, carbolic acid, and various other drugs. All such methods have proved fruitless. Even with present knowledge of the disease, many preparations are sold as guaranteed cures and preventives. None of them has stood the test of time and has served only to increase the despair of herd owners. From time to time new drugs, supported by extravagant claims and testimonials, are offered. These facts are not given with the intent to discourage the owner from treating animals with retained afterbirth or those barren animals which may respond to proper treatment. The irrigation of the generative organs is necessary in such cases and is often successful.

The owner of a herd not infected with abortion is not likely to worry about prevention. He does not often become greatly concerned until the disease appears. Nevertheless, if he is thoroughly familiar with the facts, a few simple practices can be used as everyday sanitation against the disease. There are good reasons for believing that the disease is often brought into a herd through the introduction of cows or pregnant heifers affected with contagious abortion. These animals may abort later and act as spreaders of the disease. Bulls and unbred heifers are

less liable to act as carriers and, therefore, may be added more safely to the uninfected herd. It is believed that unpasteurized milk from creameries may be a source of infection. Buying only animals that have passed the abortion test successfully would be added insurance against infection. The owner of stock who is continually adding new animals from herds he knows little or nothing about is taking desperate chances.

Until recent years there has been a great difference of opinion as to the proper procedure to check or eradicate abortion disease. Many stockmen have felt this, and some have become discouraged. They are now in the proper frame of mind to try any panacea that is offered. It will bear repetition here that there is no positive cure for animals infected with this disease. No tonic, mineral, or other preparation is of any benefit whatsoever.

Vaccines have been advocated as a preventive and cure for abortion, but they have not given satisfactory results, at least not enough to warrant their general use. Vaccines offered for sale fall into two classes. One is called a dead vaccine or bacterin and the other is made of the live germs in a weakened form. The first-mentioned vaccine has been discarded. The vaccine made of the live germs has given satisfaction in some cases, but is not of sufficient value to recommend it. The time may come when something of this nature is perfected. Until then remedies of this sort and other drugs must be disregarded.

The method to be used in an attempt to control abortion disease will depend somewhat on the individual herd and the facilities available. The first requisite would be a test of the entire herd. If the herd is not especially valuable and the number of animals reacting to the test is not great, it might be best to sell all the reacting cows. If the test shows a very large percentage of reactors, this might not be practical. This is true in the case of valuable pedigreed animals. It should also be remembered that one test will not always eliminate all the infected animals, and that two

or three tests may be necessary at intervals of two or three months.

On farms where it is considered impractical to dispose of all the infected cows, progress can be made by maintaining two herds. One would consist of the reacting animals and the other of cows found to be healthy. This can be done on some farms where two stables can be provided, with a separate set of utensils. While this will not appeal to many farmers, something can be accomplished, even though the divided herd has to be kept in the same barn. They can, at least, be separated by a partition. This is a step in the right direction. At intervals, the animals in the non-reacting group should be re-tested to eliminate further the infected ones. The writer fully realizes the handicaps of this method of control on many farms. It is suggested, nevertheless. It has been demonstrated several times that two herds can be maintained in this way, if the facilities are available. This two-herd arrangement could be continued until the healthy herd has reached a considerable number and then the infected herd could be disposed of gradually.

It should not be forgotten that the active spreader of the disease is the animal which has recently aborted and is giving off live germs in the discharges from the generative organs. This may soil the litter, and when this animal is not kept by itself the germs may easily reach other cows. Infection commonly takes place by licking these discharges. It would be a wise arrangement if the aborting animal could be kept by itself, at least until all discharges had ceased. It is a good plan to provide a box stall for the animal which is due to calve soon. After calving takes place, either normally or as an abortion, close watch should be maintained to see that the afterbirth is expelled. If this does not take place promptly and there is a live calf, great care should be exercised to prevent the calf from licking the discharges. Otherwise scours in the calf may follow.

no improvement is noticed after four or five weeks, the treatment may be abandoned and the animal removed from the herd. Painting the skin over the swelling with tincture of iodine may be tried. During the treatment the milk-flow will decrease. It should be discarded since the drug is eliminated through the milk.

Treatment, surgical or otherwise, should not be attempted unless the animal is valuable. Exception might be made in the case of an animal in the early stages of the disease when the swelling is small. In this instance either or both treatments could be tried. If no headway is made, the animal should be slaughtered.

Even though actinomycosis is not often transmitted directly from cow to cow, it is thought best to keep the diseased ones away from the remainder of the herd. They should not be permitted on pasture if they are discharging pus from an open abscess. This will lead to a widespread infection of the resulting hay crop. It is the consensus of opinion that whenever a large number of animals in a herd are infected they all contract it from the same source, namely the feed.

JOHNE'S DISEASE

This is an infectious disease of cattle. It was named after the man who first described the causal germ. In some respects Johne's disease resembles tuberculosis and, therefore, has often been called para-tuberculosis to indicate this relationship. A true relationship does not actually exist. Other names sometimes used are dysentery and chronic or constant enteritis. In Europe animals affected with this disease are popularly termed wasters or piners because of the run-down or unthrifty appearance. Johne's disease, like many others, was imported into the United States from Europe through the purchase of infected dairy cows. This disease attacks cattle chiefly but has been described in sheep. All breeds of cattle are susceptible.

Johne's disease has not been given much publicity in

this country. Farmers and veterinarians alike have refused to worry about its existence. While the disease is not a serious menace to the cattle industry, it appears to be on the increase. This apparent increase may merely indicate that it is being recognized more often. Recently, the federal government, realizing the importance of the disease, has appropriated money to be used in control and eradication.

Johne's disease has been reported throughout the dairy-raising sections of the United States. It appears to be spreading slowly but passes unidentified in many instances. Due to a similarity of symptoms, it is without doubt often mistaken for tuberculosis and *vice versa*. This might easily happen when a herd has not been tuberculin-tested.

Cause

The first men who studied Johne's disease considered it to be closely associated with bovine tuberculosis. It was also thought to be caused by the avian or chicken type of the tuberculosis germ. The germ of avian tuberculosis and that of Johne's disease look much alike under the microscope and might be confused. Both are susceptible to the same laboratory staining methods. Some investigators claimed that Johne's disease was not a distinct malady but simply the germ of avian tuberculosis appearing in cattle. In 1906 B. Bang settled the argument. He proved conclusively that, while the germ of avian tuberculosis and that of Johne's disease looked much alike and had many other similarities, they were in reality two distinct disease-producing germs and able to induce two entirely different diseases no matter how closely the symptoms of the resulting disease might resemble one another. The organism responsible for this disease is called Johne's bacillus.

Symptoms

It usually takes at least six months for an animal to show definite signs of sickness after becoming infected with

the bacillus of Johne's disease. Young animals are not often visibly affected. Symptoms are more often seen in animals over two years old. Gradual emaciation or thinness appears to be the outstanding change in the infected individual. These symptoms may continue until the animal is a mere skeleton. Diarrhea is almost always a predominant symptom. This may be intermittent. Some men have claimed to be able to recognize the disease by the odor of the manure. This is probably imaginary. The appetite may remain good. There is no rise in temperature. Since Johne's disease is a prolonged infection, an animal may show the above symptoms for many months or years before death ensues.

Johne's disease attacks the intestinal tract. When the carcass of a dead animal is opened, a careful examination should be made of the lower bowel. The inside lining of the intestine should show the typical washboard appearance. The lining mucous membrane is very wrinkled, corrugated, and thickened. If a piece of this wrinkled portion of the intestines is removed, it will be observed that stretching does not smooth the wrinkles. This is said to be the case only in this disease. There should not be much difficulty in distinguishing Johne's disease from tuberculosis because of the total absence of the usual changes associated with the latter disease. Tuberculosis is a great tissue destroyer and may affect any or all of the internal organs of the infected animal. This is not true of Johne's disease. Here the lesions or changes are found only in the intestines in the form of wrinkles. A laboratory examination of the diseased portion of the bowel would be necessary to show the presence of the specific germ of Johne's disease.

An animal infected with this disease seldom, if ever, recovers. It may be sick for years. Since it is a disease of the intestines, the germs are given off in large numbers through the manure. The germ itself is not considered especially virulent and is easily killed by ordinary disinfection. Through constant association with an infected ani-

mal, the disease might eventually spread through a herd. It is safe, therefore, to assume that a diseased individual is the most dangerous source for the spread of the infection to other members of the herd.

Any animal which shows a chronic or persistent diarrhea, together with gradual loss of flesh, should be suspected. If the herd has been tuberculin-tested and found to be clean, this would further increase suspicion of Johne's disease. Confusion with tuberculosis would be the chief handicap.

Method of control

When the disease is thought to be present, the whole herd should be tested. A product called Johnin has been perfected, which is used in the performance of this test. It is manufactured in much the same way as tuberculin, except that the germ of Johne's disease is used.

The intradermal test and the intravenous test are used. The Johnin is injected either into the skin or into the veins.

There is no successful treatment for Johne's disease. Several drugs have been employed with indifferent success. Chaulmoogra oil, used in the treatment of leprosy, has been tried, but the cost of the oil is so great and the results so dubious that it is not generally advocated. It is far better to remove all the suspected or reacting animals from the herd. In those states in which there is cooperation between the state and the federal government, an indemnity can be secured for those animals which react to the test and are slaughtered.

ANTHRAX

Anthrax is an acute contagious disease of cattle, but may affect other animals on the farm. It sometimes occurs in man and is called woolsorters disease or malignant pustule. Men who handle raw hides in shoe factories and tanneries frequently become infected. Shaving brushes have been known to carry the germs in the bristles. In live-

stock, the disease usually takes the form of an acute blood poisoning, while in man it is more likely to appear in the form of a skin disease, which leads to the formation of pustules or boils.

Anthrax is a very old disease, being first recognized in southern Europe. During the seventeenth century it often took the form of a plague and was responsible for the death of thousands of men and animals. In the United States, cattle and sheep suffer most. In some sections, where the soil is seeded with the germs, the disease recurs from year to year. Anthrax germs may form seeds or spores which are very difficult to destroy. These spores may live for many years in the soil or on hides or hair and then produce the disease when taken up by an animal. Anthrax epidemics often center about tanneries which receive foreign hides. The refuse from such factories is often dumped into streams. In spring such a stream may overflow its banks and flood the adjoining farm land. In this way the hay crop becomes contaminated. Imported hides may harbor the spores of anthrax. These spores are very difficult to destroy and may become repeated sources of infection. On some farms certain fields are known to be infected and, as a result, have to be abandoned or portions of them fenced off.

Cause

The specific cause of anthrax is a microscopic germ which was first seen and recorded in 1850 by a French investigator named Davaine. Under the microscope it appears as a square-ended rod. The germ or spore usually enters the animal body by means of food or water and thus gains entrance to the blood by way of the digestive tract. Once in the circulating blood the germs multiply rapidly by splitting in two parts. When the live anthrax germs pass out from a sick animal on to the ground, they may assume a dormant form which is called a spore. The spores are very resistant to ordinary freezing and thawing and will stand almost any temperature, including boiling for a few

minutes. Spores do not form in the animal body. Only when they are allowed contact with the air do they start to form. Spore formation might be likened to a hard-times period when the germs find it difficult to live. If a carcass is buried promptly, the spores are not likely to form. Anthrax is a sister disease to blackleg in two ways. The germs of both are able to form spores and the symptoms are somewhat alike, so much so that blackleg is often called symptomatic anthrax because of the similarity of symptoms. Both diseases are difficult to eradicate entirely on account of soil infection with the spores or seeds.

Symptoms of anthrax

The symptoms will not be a great help to the farmer. This is a disease for the expert. Even then it may be overlooked unless there is some warning of its previous existence on the farm. The first warning often comes with the discovery of an animal dead on pasture. Sick animals have a high temperature and may show fever, chills, and rapid breathing. Sometimes an owner will say that the herd was apparently all right the night before and in the morning a cow was found dead. The dead animal may show a bloody discharge from the nose or rectum. In the animal approaching death, blood may be noticed in the urine. This symptom gives rise to the term redwater. Swellings may be seen about the head and neck. One should never open an animal suspected of having anthrax. It is very dangerous and should be left to the state authorities. A post-mortem examination will show extensive hemorrhages throughout the carcass. If anthrax has been found in the neighborhood before the present losses, it would be well to notify the local veterinarian so that proper control measures may be put into action. It will usually be necessary to differentiate this disease from blackleg. It is well to keep in mind that blackleg affects young animals most. Anthrax affects animals of all ages. The blackleg swelling usually found in the region of the shoulder or thigh will

crackle under pressure of the hand. Positive diagnosis requires a laboratory examination.

Cure and prevention

There is no cure for an animal infected with anthrax. The proper procedure is to institute a thorough investigation and make sure that anthrax is present. One should never skin an animal after death from anthrax. It is not only dangerous to the one doing the skinning, but also to anyone who may handle the hide thereafter.

Vaccination is the only known method of control. All healthy animals should be vaccinated immediately. This is best supervised by the state live-stock sanitary authorities. In many states these officials assume complete charge of the outbreak, taking whatever steps are considered necessary. Vaccination for this disease, as in some others, consists in giving the animals the disease in a mild form. After vaccination an animal is fully protected and may go in perfect safety anywhere on the farm. The first successful vaccine was prepared by Pasteur in 1881 and has been in continuous use ever since. The Pasteur method required two vaccinations a few days apart. This has been considered a disadvantage. Sobernheim later developed a type of immunization called the serum vaccine. This required the use of immune horse serum, together with a weakened vaccine of live germs similar to Pasteur's. Even this method has its disadvantages. The United States Bureau of Animal Industry then developed a variation of the Sobernheim method, using the same immune horse serum, together with a vaccine made from the anthrax spores instead of the germs themselves. This spore vaccine is more stable than the Pasteur vaccine employed in the Sobernheim method. When the immune serum and spore vaccine are used, the animal is almost immediately rendered immune from anthrax. Both serum and vaccine are injected at the same time, thus requiring only one handling. Annual vaccination is necessary.

After an anthrax outbreak it will be impossible to disinfect the entire farm. Low places, which may be infected, should be drained if possible. All carcasses should be burned or buried deeply. Burning is perhaps the best method, but this is difficult unless the carcass is raised above the ground and the fire placed underneath. Even then the rumen or paunch and its contents will be difficult to destroy. When burial is employed, the hole should be at least six feet deep; roll the animal in and cover it with quicklime. It is a wise precaution to poke holes in the carcass after it is placed in the hole and pour crude sulfuric acid over it. This can be done if the acid is available. A carcass must never be skinned or opened. All the soil that is badly contaminated with blood must be burned or buried. Places in the pasture that are known to be badly contaminated should be fenced off and not used thereafter. The burial ground should not be employed for grazing purposes.

HEMORRHAGIC SEPTICEMIA OF CATTLE

Hemorrhagic septicemia is known by such other names as broncho-pneumonia, stockyards fever, and shipping fever. It affects cattle, sheep, swine, and chickens. While it is stated that this disease may affect several kinds of farm animals, the species of germ is different in each case. In other words, cattle do not infect swine, and sheep are unable to transmit their type of the disease to chickens. The disease is much the same and gives rise to the same general symptoms, but each class of animal has its own distinct variety of germ. One might compare the different species of germs in this disease with those of the tuberculosis germ, as it affects cattle, chickens, and man. When hemorrhagic septicemia occurs in swine it is called swine plague. In sheep it is termed catarrhal fever. In chickens the name of fowl cholera is frequently used. In this chapter only cattle will be considered. For a discussion of the disease in other animals, the reader is referred to their respective sections.

Hemorrhagic septicemia is distributed throughout the United States and Canada and is responsible for some confusion in the mind of the average stockman, because the diagnosis has been applied too loosely in many instances.

The symptoms shown by animals infected with this disease closely resemble several others and as a consequence mistakes have been made. The name itself is rather awesome. The writer will endeavor to describe the disease so the reader may have some conception of the obstacles that must be overcome before an accurate diagnosis can be made.

Cause and occurrence

Hemorrhagic septicemia of cattle is an infectious disease. The germ causing it is called *Bacillus bovisepiticus*, the bovi part of the name meaning cattle and septicus a blood poisoning. The germ is almost everywhere in nature. A laboratory diagnosis is often difficult because certain harmless germs closely resemble this one. In some cases these seemingly harmless germs have so increased their virulence or disease-producing ability by passing through several animals as to be able, when injected into their blood, to kill guinea pigs. The germ of hemorrhagic septicemia is frequently present in the soil and is often found in the air passages of healthy animals. Seasonal or other changes may cause the disease to start at certain times. During particularly changeable or inclement weather, cattle seem to be more susceptible. The outbreaks do not spread from farm to farm and may disappear as suddenly as they begin. Cattle of all ages may be infected, but young animals seem to suffer most. Herds which are in poor condition are very susceptible. Cattle brought on the farm from stockyards are often in a run-down condition from prolonged travel and exposure. This accounts for the name stockyards fever. They may appear healthy when purchased at the stockyards, but soon after their arrival on the farm, the disease may appear. Like all septicemias or blood poisonings,

this disease runs a rapid course and animals die quickly after the first symptoms appear.

Symptoms

Hemorrhagic septicemia progresses rapidly. The animal usually dies or recovers in a week or ten days. The temperature rises as high as 106° or 107°. When the lungs are affected, the breathing may be rapid and painful. Swellings may be seen about the head and neck. The animal becomes very weak and totters about the yard or pasture. The eyes may be inflamed and show a discharge. Coughing is noticed together with a blood-stained mucous hanging from the mouth and nose. When the intestines are affected, there may be bloody diarrhea and the animal may appear tucked up in the flanks. The intestinal form is very exhausting and an animal quickly becomes very thin and may die in a few days. When the lungs are affected, as shown by the cough and other respiratory symptoms, a severe pneumonia may result to hasten the end. All the symptoms mentioned are not usually present at the same time. In fact, only one or two may be in evidence.

The diagnosis of this disease is best left to the experienced veterinarian. Nevertheless, a brief description of the carcass may be of interest. First, swellings are found under the skin. They may be doughy and stained with blood. If the observer is not careful, this may be mistaken for black-leg, especially if the swelling is in the region of the flank or shoulder. The membranes lining the nose and throat may be reddened and the air passages of the lungs may be filled with blood-stained mucous. If the lung type of the disease is seen, there may be a pronounced pneumonia with solidification of one or more lobes. The heart may be spotted with pin-point hemorrhages. As the name indicates, the presence of hemorrhages is the outstanding lesion. In the intestinal form, the bowels may be filled with blood-stained feces. The intestinal wall also may be inflamed or reddened. When an animal dies very suddenly, all these

changes may be absent or not in sufficient extent to make a positive statement. A diagnosis on the farm is next to impossible. A laboratory examination is necessary to clinch the diagnosis. In a disease of this sudden nature it is imperative to differentiate from both anthrax and blackleg. A bacteriological examination will accomplish this. It will be best to secure outside help and send in specimens of the carcass to an animal disease laboratory.

Methods of control

Medical treatment of the sick animal is generally useless. When treatment is attempted, immune serum should be used. This is prepared by many biological houses. The most important initial procedure is to establish the identity of the disease. It would be extremely dangerous to human health to have an outbreak of anthrax pass for hemorrhagic septicemia. This mistake could easily be made. All the apparently well animals should be separated from the sick ones. The healthy group should be well fed and built up in health as rapidly as possible. This will go far toward stopping the outbreak. The disease must not be allowed to get under full headway before an investigation is started.

The remaining healthy animals may be vaccinated or immunized against the disease. Three types of inoculation are standard. One may use either the aggressin (a product made the same way as blackleg aggressin), the vaccine, or the bacterin treatment. The vaccine is made up of live weakened germs and the bacterin is composed of dead organisms. While the aggressin is commonly favored, the selection of the precise method of immunization should be left to the discretion of the attending veterinarian.

TEXAS FEVER (TICK FEVER)

The name Texas fever is not a good one. Tick fever would be much better. Texas fever is known by a dozen or more other names, such as bovine malaria, redwater, murrain, and splenic fever. Texas is not the only state in

which this disease exists. It is common throughout the south Atlantic and Gulf states. Northern states are free from this infection. One outbreak was described as far north as Pennsylvania many years ago. This started through the importation of infected cows from the South.

Tick fever is a specific infectious disease of cattle only. It is thought to have been introduced into the United States by way of Mexico. Smith, of the Bureau of Animal Industry, was the first to demonstrate the cause of this disease. Later on the cattle tick was discovered to be the necessary agent in the transmission of tick fever from one animal to another. Tick fever is a blood disease, the protozoa responsible for it causing the destruction of the red blood corpuscles. Fever develops followed by a wasting away of the animal body. Blood-colored urine is a constant symptom. Animals not raised in the tick-infested states are especially susceptible and suffer a heavy mortality when exposed to the attack of infected ticks. Many animals which are able to spread the disease are apparently healthy, even though they have the germ of Texas fever in their blood. Texas fever can be transmitted only by cattle ticks under natural conditions.

Cause

Texas fever is caused by a protozoa. The blood of all cattle having this disease contains this germ or parasite. It is possible to produce the disease in a healthy cow by injecting into it the blood taken from an individual infected with the disease. On the farm, infection takes place only by the bite of a cattle tick, which harbors the germ in its body. Climate has nothing to do with the existence of this disease, except that the warm southern weather is favorable to the development of the ticks. In the northern states, they cannot withstand the cold winters.

The life history of most animal parasites is fascinating. That of the cattle tick is no exception to this rule. The adult female tick which is found attached to the infected

cow becomes fully developed, and after being fertilized by the male tick, fills up with the blood of the cow and falls to the ground. It may then lay as many as 3,000 eggs. When the eggs are laid or deposited on blades of grass, the female tick withers and dies. If the weather is warm and otherwise favorable, the eggs hatch out in a few weeks. If the weather is unfavorable, the eggs may lay dormant for several months, even through an ordinary southern winter, and hatch out in the spring. The eggs hatch or become larvæ or small seed ticks. They have six legs and are brown in color. They crawl about on the grass and sooner or later attach themselves to the skin of a passing cow. The young growing tick gets its nourishment at this time by drawing blood from the cow. The tick is still very small. It would hardly be noticed. At this stage the little tick is able to transmit the disease to the animal host. After fertilization it increases in size and a few days later drops from the animal and thus another life cycle is started. It is known that the female ticks transmit the disease through their offspring. Texas fever is not transmitted by the tick that takes the infected blood, but rather from the offspring of the infected female tick. The female tick itself does not travel very far but may be carried easily by persons, stock cars, and cattle harboring the ticks.

There are eight other species of ticks. Only one variety carries Texas fever. This may be distinguished from the others by its size, shape, and color. The head is short and broad. The body is up to $\frac{1}{2}$ inch in length and oval in shape. The color ranges from yellow to olive-brown and may be mottled with uneven areas of yellow and brown. Two parallel grooves are seen on the back, just behind the head parts. Three parallel grooves are on the posterior part of the back. The tick has the general shape of a coffee bean and has four pairs of slender legs. The Texas fever tick lives chiefly on cattle but has been found on horses, mules, and deer.

Losses from tick fever

The annual losses from Texas fever have been tremendous. They have been estimated from \$40,000,000 to \$75,000,000 each year. Interstate shipment from the tick-infested territory is prohibited, unless the cattle are dipped and freed of the ticks before shipping. This involves considerable expense and the market also discriminates against southern cattle by receiving them at greatly reduced prices. The hides also bring lower prices. Cattle heavily infested with ticks do not give as much milk as healthy cows. Northern cattle cannot be introduced into a southern herd without considerable danger of infection after their arrival. Such imported cows may be immunized, but even this is not always successful. Many of the cattle, not so prepared to resist the disease, die.

While native southern cattle raised on tick-infested pastures are usually immune, many deaths occur among stock raised on tick-free pastures and then subsequently exposed to infection. Cattle develop natural immunity in the South only when they are raised from birth in constant contact with infected ticks. If they should be on clean pastures for several years and then become exposed to infected ticks, they are just as likely to have the disease as northern cattle.

Symptoms of Texas fever

There are two types of Texas fever—acute and chronic. The type might depend on the susceptibility or health of the animals infected. Under natural conditions Texas fever may begin from ten to ninety days after the cows are put into a tick-infested pasture. When artificial inoculation is used, the cow will be sick and show symptoms in four to ten days.

As the name would indicate, the acute type moves rapidly. The temperature rises quickly to 107° or 108°. The animal appears sick and may stand off by itself with head lowered in a dejected attitude. There is loss of appe-

tite and rumination stops. Constipation alternates with diarrhea. Respirations are increased and jaundice may be present. The urine is often blood-stained. The blood sometimes loses considerable power to clot and if injured the animal may bleed freely. The milk-flow stops or at least is greatly diminished. Pregnant animals usually abort. Death may occur soon after the general symptoms become established.

The chronic form is the long-drawn-out type of Texas fever. It is most prevalent during the fall and winter months. The disease runs a much slower course and the animal does not always die. The fever is much lower, being about 103° or 104° . The animal loses flesh gradually, is a poor feeder, and does not give much milk. The bloody urine is not seen in the chronic form. Even though the cow does not die, it is very unprofitable. Deaths from Texas fever are higher in summer than in winter.

There is a chance that Texas fever might be confused with such diseases as anthrax, blackleg, and anaplasmosis. Texas fever does not exist in northern states. Blackleg may occur in any part of the country. In Texas fever, ticks are commonly found on the skin of the suspected animal. When cows are imported from a northern state into a southern herd, diagnosis should be easy from the history and the finding of the ticks on the animal. In Texas fever the mucous membranes are pale, while in anthrax they are red and inflamed. Blackleg is a disease of cattle under two or three years of age. Tick fever affects cattle of all ages. A cow with no ticks on its body which died showing swellings about the shoulders or flanks, might point to blackleg. This would be especially true if air were found under the skin and the darkened flesh had the characteristic sweetish odor of blackleg. While anaplasmosis closely resembles Texas fever, it is not nearly so common. It has many characteristics in common, and is transmitted by more than one variety of ticks when found in tick-infested areas. A laboratory examination would

be necessary to differentiate this disease from Texas fever.

Cure and prevention

A cure is not often sought. All efforts have been directed toward prevention of Texas fever by the eradication of the tick responsible for the spread of this plague. Immunization has been used with varying success but is not seriously considered in the ultimate control. All efforts are directed eventually to wipe out the tick and to this end federal and state governments are cooperating in its wholesale destruction by dipping all cattle in the tick-infested areas. Much progress has been made and there is reason to hope that before many years the southern cattleman will not be penalized and handicapped by this parasite and the disease it is able to produce.

RABIES

Most persons have a horror of rabies. The announcement that rabies exists in a community is sufficient to cause much excitement. Rabies is another name for hydrophobia. Dogs suffer most but all domestic animals may become infected. Its occurrence in man is by no means rare. The dog is the common host of the disease, and other animals including man are usually infected by the bite of a rabid animal. Such an animal is said to be mad. It is well to know that all dogs that bite are not mad.

There are many superstitious beliefs concerning the actual cause of rabies. However, rabies can be transmitted naturally only by the bite of an animal actually sick with the disease. Warm summer days are called dog days and during this season dogs are thought to be especially liable to be affected. This is not true. Rabies can occur at any season of the year.

Rabies is widely distributed throughout the civilized world. Australia alone remains comparatively free. This is due to a very rigid quarantine regulation against all

imported canines. Next to dogs, cattle are most likely to be infected. The reason for this is apparent on any farm where dogs are used to attend cattle.

Causes

Rabies is infectious. It is centuries old. The true cause of the disease has never been discovered. Rabies is an affection of the nervous system only. The germ is found in the saliva of the rabid animal. The blood does not carry the infection. The saliva would seem to be the most dangerous source of infection, since the contagion can take place naturally only by the bite of a rabid animal. Even though the true identity of the germ causing rabies is not known, the disease can be recognized easily by a laboratory examination of the brain and spinal cord from the suspected animal. The virus or germ of rabies travels by way of the nervous system. For example, when a rabid dog bites a cow, there may be an injury to the nerves in the wound and the germ in the dog's saliva finds easy entrance. If the animal is bitten about the head, the disease will begin sooner than if bitten in the hind leg, because of the greater distance the virus must travel to reach the brain. It is probable that not all bites are infective, because when the wound bleeds freely the virus may be washed away. When the virus enters the nerve at the point of the bite wound, the symptoms develop only when the virus reaches the brain. This may take two weeks or it may require a year. Most cases of rabies would occur within three months after an animal was bitten.

Symptoms

Cattle, like dogs, have both the furious and the dumb form of rabies. The first is the most common. When dumb rabies is present, it is probably a later stage and begins after paralysis is evident. The first symptoms usually noticed are loss of appetite, stopping of milk-flow, and great nervousness. A very gentle animal may suddenly become

vicious. These symptoms may become more pronounced until the stage of great excitement is reached. The animal may paw the ground, bellow, and try to attack attendants. Saliva may drip from the jaws and muscular spasms or trembling may be noticed. During this time the animal may lose flesh rapidly and exhaustion soon replaces excitement. Paralysis now begins. The animal may go down and appear asleep. This might be followed by convulsive tremors. About a week may elapse before the animal dies after the onset of the disease.

The diagnosis is not easy from the symptoms alone. When the country-side is in the midst of an epidemic, any animal showing the above symptoms would be suspected. The fact that rabies exists among the neighborhood dogs would help in identifying the disease in cattle. Some other diseases, such as vegetable or mineral poisons, might give rise to nervous symptoms which would be misleading. A post-mortem examination would determine this. Rabies might be confused with tetanus or lock-jaw. In tetanus, muscular cramps would be more common and there would be no evidence of viciousness. The animal would remain quiet and gradually become rigid. When there is any possibility of rabies, the suspected animal should be examined carefully by a veterinarian and portions of the brain and spinal cord sent to a state laboratory for examination. This would positively identify the disease.

Treatment

After an animal shows active symptoms, treatment is useless. If the wound could be cauterized or burned immediately after the bite, some benefit might follow. In most cases, there is no warning until the animal is sick. Perhaps the owner can recall that the animal was bitten a few months before.

Pasteur developed a successful preventive vaccine against rabies in man. A similar treatment is used to vaccinate dogs. Very little has been done in the vaccination of cattle,

since it is not economically important. Most state sanitary authorities are interested most in the destruction of all infected individuals that may be a source of infection to both man and other animals.

PINK-EYE

Pink-eye is a contagious disease of cattle as well as of other farm animals. It is also called contagious sore eyes. It usually spreads rapidly through a herd, unless it is recognized early and the first infected cows or calves placed by themselves. The disease probably comes into a herd through the purchase of an infected animal. Animals of all ages may be affected. Some farmers report a reoccurrence of the disease each year for two or more seasons.

Symptoms

Only one or two animals are usually affected during the first few days of the attack. If steps are not taken, others will be infected rapidly until the disease spreads through the entire herd. Pink-eye is really an inflammation on the membranes about the eye. It is accompanied by a watery discharge that turns to pus after a short time. The eye itself is reddened and the lids are swollen. The discharge runs down the face and frequently mats the hair, making the animal very unsightly. The animals avoid strong lights and keep the lids closed for protection. As is natural in a disease of this kind, the animals go off feed and there is a decrease in milk-flow. The eye is very sensitive to the touch, causing the cow to blink or flinch when an examination is made. There may be a fever. After a time the eye itself clouds over and may become entirely opaque. Sores and ulcers sometimes appear on or near the eye.

Treatment

The best treatment for this as in other acute contagious diseases is early recognition of the trouble and separation of the sick animals. The healthy herd should be kept on a

clean pasture. The sick members of the herd should be housed in clean dark quarters. The dark or reasonably dim light will help to make the animals more comfortable. An abundance of fresh water and easily digested feed should be supplied. A dose of Epsom salts may be given in a quart of warm water. The eyes and face should be bathed frequently with a warm boric acid solution; use $\frac{1}{2}$ teaspoonful of boric acid to a quart of warm water. This will relieve the irritation and itching. After this place a drop or two of a 10 per cent solution of argyrol in the eyes once or twice a day. The argyrol solution should be secured fresh from the drug-store. Use a medicine dropper to drop it in the eyes. Wash the hands carefully after treating the sick animals.

CHAPTER III

DISEASES OF THE UDDER

DAIRY cows are kept for their ability to produce milk. A healthy and efficiently functioning udder is the chief asset of a good dairy cow. A pedigree is only as good as the milk-producing qualities of the line of females in the family tree. The modern cow secretes many times the quantity of milk nature intended her to produce and, as a result, the udder has become one of the most sensitive and highly developed organs of her body. This is a day of specialization, and the dairy business is no exception to this rule.

Intensive feeding and breeding methods have brought about an abnormal condition of the udder. It has greatly increased in size. This alone has led to some disturbances. The animal herself is highstrung and may even be said to be temperamental. The record-breaking cow on test is often handled with special care lest anything disturb her nervous reactions and thus lessen the milk-flow. Present refinements of feeding, breeding, and handling have given rise to certain udder troubles seldom seen in the little red cow of former years. The cow of today is far too valuable to permit careless handling. Most dairymen have come to realize that the health of a good cow should not be ruined by mistreatment of the udder. Darning needles and hat-pins are decidedly out of fashion in the treatment of hard milkers. The udders of many good cows have been ruined by the introduction of dirty milk tubes into the teat-duct. More udders have been destroyed by the general misuse of milking tubes than were ever benefited by the treatment. A

cow with a sick udder should be taken seriously. This is not a time to consult all the local oracles and then administer treatment indiscriminately. One shudders to think of some of the so-called surgical operations perpetrated on the udder. The udder should be recognized as a highly organized part of the cow's anatomy and treated with respect. At best, treatments for udder diseases are none too good.

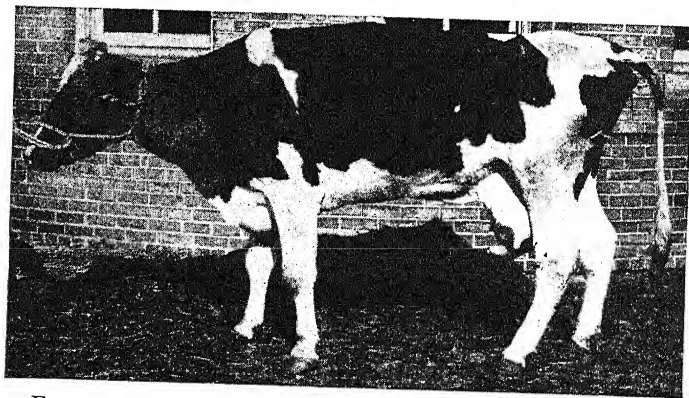


FIG. 2.—This animal suffered for many weeks with garget. Note the run-down condition and the shrunken appearance of the udder; the left half is entirely destroyed.

It is best to proceed with caution and, wherever possible, consult a qualified veterinarian.

GARGET

Garget is an inflammation of the udder (Fig. 2). It is also called mastitis. At meetings where farmers gather perhaps no other disease is so much discussed. It is by far the commonest disease of the udder and is more serious than is generally supposed. Many cows are rendered useless for milk production from garget. It may begin as a simple inflammation of one quarter. If ignored or treated with dirty instruments, the disease often spreads to other

Symptoms

General depression is seen first. Loss of appetite together with signs of uneasiness usually accompany this. The udder is sore and feels warm. The milk-flow is lessened and the act of milking may be painful. The milk itself is likely to be stringy or come out in lumps or chunks. It may be vari-colored. The clots are commonly yellow but may be other hues, depending on the nature of the germs invading the udder. As the disease progresses, the milk may have a foul odor. These symptoms often continue until the udder becomes hard or indurated. This hardness of the udder is called caked bag. Treatment should be instituted before the udder becomes hardened.

Treatment

One should not wait too long before treatment is started. It frequently happens that nothing beneficial is attempted until the udder becomes very hard. This hardness may take in one or more quarters. It may have even gone so far as the formation of abscesses with resulting gangrene of the udder.

Always milk the infected individual last. This will prevent carrying the infection to other animals in the herd. Do not lose sight of the fact that this is an infectious disease. If a milking machine is in use on the farm, the infected cows should be milked by hand. While treatment is not always as successful as it might be, it is of utmost importance that it be begun as early as possible. Never wait until the udder is as hard as a brick. Some are so hard that it is difficult to dent them with the thumb. If taken early, simple home treatments are of great benefit. Since the disease is infectious, always use a special pail to milk the sick cows. Do not squirt the stringy or yellow chunky milk on the litter. This may be a further source of infection to other cows, and may set up a digestive disturbance in those calves that lick up the milk. The infected milk should not be used for any purpose.

The easiest treatment is very simple. First of all, give

the cow a big dose of Epsom salts, if there is any sign of constipation. A pound of Epsom salts dissolved in warm water and given as a drench from a long-necked bottle should be sufficient. Secure a pail of hot water and an old bath towel. Besides these, some lard or camphorated oil will be needed. Even castor oil will do. First, dip the towel into the pail of hot water and after wringing it out carefully, apply it to the udder. Do this in the same way a barber would apply hot towels to the face before and after shaving. The water should be piping hot. Remember that the udder is tender and the animal nervous. Care should be exercised to be in a proper position for a quick move if this becomes necessary. After a trial or two, it will be easy to keep the towel about the proper temperature for comfort. Continue to apply the hot towels for five or ten minutes. After this, thoroughly grease the udder with the lard or oil. Massage the udder for several minutes. Do not merely pat it here and there. Knead it as you would bread dough. This is especially important if the udder is hard or caked. Repeat this treatment twice a day until improvement is seen. Udders that are very hard will often respond well to this treatment. If the udder is extremely sore and sensitive, it may be given support. Take a piece of an old bed sheet and tear off a strip about 18 inches wide. Pass it under the udder and up over the back. Where the bandage passes under the udder, cut holes for the teats. This will help to keep it in place. If the affected udder is heavy and pendulous, this should relieve the pain.

Ordinarily it is best not to irrigate the udder with any fluid. This usually does more harm than good, serving only to spread the infection to other quarters. This is especially true when great care is not observed to boil everything carefully before the irrigation is begun. Formalin is recommended by some as internal treatment. It is not always a success, but may be tried. One-half ounce of formalin is dissolved in a quart of milk and given as a drench. This is repeated every day for three days.

This may be tried with the hot water and massage. If possible, the sick animal should be kept in a box-stall away from the other cows and fed easily digested feeds in the form of mashes. The caretaker should always be careful to wash his hands after attending an animal affected with garget.

Many patent medicines are on the market for the treatment of garget. Most of them embody essentially the same mode of treatment as mentioned in these paragraphs.

COWPOX

Cowpox is a contagious disease affecting the udder. It is transmitted by direct and indirect contact with an infected animal. Formerly it was thought to begin spontaneously, but this is not true. The infection must be carried to the healthy cow in some manner.

Symptoms

The disease begins as a mild fever which is rarely noticed. The owner first observes that something is wrong by the soreness of the teats to the touch. If the udder is examined it is found to be warm and reddened. After a few days small red nodules or pimples about the size of a pea are observed. These increase in size and numbers until about the seventh day they may be an inch in diameter. During this interval the milk-flow diminishes and the pea-like swellings become blisters. These often break to exude or give off a straw-colored liquid. Later the blisters become filled with pus and gradually become darker until a brownish scab forms. These may in turn fall off and leave the skin pitted. The scabs frequently become raw sores from the constant irritation of milking. The sores are very slow to heal.

Treatment.

If only one or two animals are affected, they should be placed by themselves and attended last. This is a con-

tagious disease and steps should be taken to prevent its spread to the balance of the herd. The milker should be very careful to wash his hands after each milking of an infected cow. This is the most common source of spread from one animal to another. Often the owner does not recognize the trouble as cowpox until it has spread to several animals in the herd.

Treatment consists chiefly in stopping the spread of the disease and healing the sores on the affected animals. Law recommends bathing the udder with a solution of $\frac{1}{2}$ ounce of sodium hyposulfite dissolved in a pint of warm water. Zinc ointment is also used as a salve to heal the sores. Carbolated vaseline and iodoform paste also give excellent results. Some persons do not like the odor of the iodoform, and, as a consequence, this is not popular.

ABSCESSSES

Garget is often followed by abscess formation. When these occur, expert help should be secured at once. The abscess may be in the interior of the udder and drain into the milk reservoir. The accumulated pus would then come out through the teats during milking. Sometimes the abscess will be near the surface of the skin and take the form of a swelling which tends to come to a head. Abscesses inside the udder are difficult to treat and the hot water and massage should be used together with general good care. This is done in the hope that nature will be encouraged to throw off the infection. The abscess near the surface of the skin should be opened and drained. The application of hot packs, as stated under the treatment for garget, will hurry a swelling in coming to a head. It should then be lanced carefully. If the abscess is small and does not involve much area, treatment is frequently successful. When the abscessed portion of the gland is large, beneficial results are extremely doubtful. The abscess may be dried up, but the quarter is likely to be destroyed permanently. When gangrene takes place, treatment is useless

except in the case of a very valuable cow. Amputation of a diseased quarter is sometimes attempted, but the results are not gratifying, and should not be considered for the average cow.

TUBERCULOSIS OF THE UDDER

Tuberculosis is common in cattle but all tuberculous cows do not have the disease localized on the udder. The dairyman will not be able to recognize this disease without the aid of the tuberculin test. If the animal has tuberculosis in the udder, probably other organs of the body will be affected also. Tuberculosis of the udder usually manifests itself by swellings well up in the quarter. They are small at first and increase in size. The small swellings may persist for years and pass unrecognized for tuberculosis. It would be good practice in herds that have not been tuberculin-tested to be suspicious of all persistent swellings of this nature. The simplest means of diagnosis would be the tuberculin test of the suspected animal or, better still, the whole herd. Milk samples could be taken and sent to a laboratory for examination. This might not be sufficient proof in case the germs were not found, because the abscess at the center of the swelling might not yet be discharging the germs of tuberculosis into the milk reservoir. There is no cure for tuberculosis of the udder. The animal should be disposed of.

WARTS

Warts occur on various parts of the udder. The teats are especially favored. While warts are not dangerous to health, they are a source of irritation both to the milker and the animal. Frequent milking sometimes makes the teats sore from continually rubbing the warts. Their removal is simple. Some of them may be clipped off with scissors and seared over with a red-hot knife-blade or a stick of lunar caustic. If the wart is long enough, it may be tied off with a piece of silk fishline, tied tightly about

the base of the wart. This will cut off the circulation of blood to the wart, and it will slough off in a few days. Other treatments closely resemble those applied for warts in man. Repeated applications of glacial acetic acid are very useful. Greasing with castor oil has been advocated. Clipping the warts or the use of the acetic acid is probably the best method. The glacial acetic acid and the lunar caustic can be secured at any drug-store.

CHAPPED TEATS AND UDDER

Chapped teats or udder may be brought on by exactly the same causes which produce a like condition on the hands and face of man, such as undue exposure to cold winds and rain. Unsanitary conditions in the stable when the litter is wet will often be a predisposing cause. A too aggressive sucking calf might irritate the skin of the udder and cause it to crack or become inflamed. The trouble begins as a simple reddening of the skin and may continue until sores are formed.

Treatment is not complicated. First of all, provide a dry stall for the affected cow. Keep the bedding dry and use plenty of it. Secure a bottle of any good skin lotion containing a large proportion of glycerine. A few hand applications should show marked improvement. Plain vaseline may be used to anoint the udder. If this treatment does not help, bathe the udder with any mild antiseptic. Warm boric acid solution is good, a teaspoonful of boric acid to a quart of warm water. After bathing and drying with a clean towel, apply benzoated zinc ointment. The druggist can supply this.

TUMORS AND STRICTURES

For no known reason, tumors in the teats are commonly called spiders. A tumor is a hard growth and may be either on the teat in the form of a wart or inside the teat canal. When the latter, it is often called a bean in the teat. This

is probably due to the feeling of the swelling during milking. The removal of a tumor in the teat-duct should not be attempted unless it interferes with milking. In this case the animal is called a hard milker. A surgical operation is necessary and should never be attempted by any other than an experienced veterinarian. It is common practice to introduce knives of various sorts into the teat and attempt to scrape out the obstruction. Even the skilled operator may not be successful in removing the growth without some risk to the animal. The careless use of teat instruments for this trouble has been a source of much infection and ultimate loss of animals.

Strictures in the teat are usually caused by an injury to the inside lining of the teat canal. The misuse of a milking tube or teat dilator might so injure it. A stricture results from the formation of scar tissue which shrinks and narrows the opening in the teat. Scar tissue does this anywhere in the body. Sometimes a tear or wound at the teat opening will bring on scar formation and a partial closure of the teat, making the animal a very slow milker.

Treatment may consist in an attempt to stretch the opening. This is accomplished by means of teat dilators. When metal ones are used, they should be carefully boiled each time before they are inserted into the teat. The dilators are usually inserted in the teats for a few hours before milking. If the use of the dilator does not bring relief after a few days trial, it is unlikely that much benefit will be derived. Milking tubes are often employed to make milking easier. These, also, should be sterilized each time. If not, they are a source of danger, and will do more harm than good.

In case of either a tumor in the teat or a stricture with the resulting difficulty in milking, it would be well to have the animal examined to determine whether it would be best to resort to an operation for permanent relief. The milking tube and the teat dilator are makeshifts and seldom result in lasting benefit.

BLIND TEATS

Blind teats are those which may be either closed from birth or which have suffered an injury at the external opening and become closed by the formation of scar tissue. When the closure exists from birth, it is not often discovered until the animal freshens for the first time. Examination would show the lack of a normal opening in the teat. Whether the closure existed from birth or was the result of an injury, the treatment would be the same, namely a surgical operation to make a new opening.

Sometimes an animal suffers an injury to the teat opening. Another cow may have stepped on the teat, or it may have become torn in a barbed-wire fence. If left unattended, it may close up from the resulting scar formation. A milking tube should be inserted at intervals during the healing period to prevent the closure of the natural opening. One must be sure to sterilize the tube each time. There are antiseptic tapes on the market which are used for this purpose. The tapes are inserted into the teat opening and left there between milkings until healing takes place.

LEAKY TEATS

An animal with one or more teats continually leaking milk from a full udder is always an aggravation to the herd owner. It does not affect the general health of the cow in any way, but does affect the owner's disposition. A teat inclined to dribble milk is always worse late in the afternoon when the udder becomes distended. The loss of milk may not be serious, but the condition is as annoying as a leaky radiator on an automobile.

Cause

Leaking may be the result of an unsuccessful teat operation. The animal may have been a difficult milker, and an operation performed to relieve this trouble. Perhaps the opening was made entirely too large and the teat would

naturally drip milk. Some heavy milking cows may leak from a teat or two when the udder is heavy and pendulous and engorged with milk. This is not necessarily harmful and only occurs when the udder is not emptied promptly. This might happen in the case of a long delayed milking. A teat may leak at its natural opening or the leakage may take place from the side as a result of an injury such as a barbed-wire cut. This is called milk fistula.

Treatment

Plugs are sometimes used to stop the leaking from a teat. These are not successful, for they only serve to stretch the opening further and do more harm than good. If the leak is the result of an unsuccessful operation by an unskilled person who has used a teat slitter too industriously, the work will have to be done over again by one who understands the proper method. Even then the repair operation has not the same chance of success that might have followed a successful initial operation. The moral is not to attempt a teat operation unless it can be done properly. The second operation will be necessary to reopen the original incision and create new scar tissue and possibly cause the teat opening to draw together enough to prevent further leakage.

If it is desired to correct a teat fistula when the unnatural opening is the result of an injury, it will be best to wait until the cow is dried off. At this time the edges of the opening could be reopened and sewed together. If an animal that is milking heavily receives a cut on the teat, it will be best to have this sewed carefully to avoid the development of a fistula. Both operations should be performed by a veterinarian.

EXTRA TEATS

These are called supernumerary teats. Sometimes animals have an extra teat. It is usually undeveloped and may be unsightly. It will not affect the animal in any way except that it may be in such a location as to interfere with

easy milking. In a pure-bred show animal it may be deemed wise to have the extra teat removed. This, also, is a surgical operation and should be performed with care. If the animal is not specially valuable and the teat does not interfere in any way, it is best to leave well enough alone. Some men have clipped them off with a scissors. This is not altogether safe as it may lead to the formation of a milk fistula if the teat is functioning.

BLOODY, ROPY OR STRINGY MILK

Milk may be blood-stained for various reasons. There may be a stricture or an obstruction that makes the animal a hard milker. Extra force is often used to extract the milk, and this undue pressure may cause the stricture or obstruction to bleed. This would stain the milk. The udder may sustain some injury or bruise which bleeds into the milk reservoir. Certain germs produce a red color or pigment when growing in milk. This color change is more likely to appear after the milk is set aside for a few hours. This would give the germs a chance to multiply and color the milk. Bloody milk is sometimes seen during an ordinary case of garget. Treatment for this condition is the same as for an ordinary case of garget. If the bleeding takes place in the teat-duct from an obstruction or stricture, this should be corrected.

Blue milk is caused by a germ-infected udder. This particular germ differs from the one causing red milk. Here, the pigment produced is blue. This takes place usually after the milk has been drawn some time. Some advocate irrigation of the udder whenever blue or red color occurs after the milk stands for an interval. Irrigation of the udder with strong antiseptics is not good practice. Hot fomentations should be applied as before directed for garget. If this does not bring relief, udder irrigation may be necessary.

Ropy or stringy milk may accompany a simple uncomplicated case of garget or it may affect a healthy cow at

intervals of a few weeks for a day or two at a time. It is commonly thought to be the result of some feeding irregularity. A low grade infection in the udder may be a cause. The infection is not severe enough to bring on a typical case of garget, but may be sufficient to cause periodical changes in the milk.

When possible, a change of pasture is suggested if the milk continues to be ropy. If the milk becomes stringy only after standing, it is possible that prompt pasteurization would stop this. If the milk persistently comes ropy from the udder, apply hot towels and massage.

DECREASED OR SUPPRESSED MILK-FLOW

The technical term for this condition is agalactia. The natural flow of milk may be entirely absent or reduced greatly in amount. This trouble often causes serious inconvenience to the owner. No one knows the exact cause but various guesses are made. If the animal is in poor health from any cause, this would tend to make it understandable. A previous and long-drawn-out attack of garget might leave its mark in lessened udder functioning. If the herd is not well fed and cared for, a lessened milk-flow might follow. Usually, however, it occurs for no apparent reason.

The treatment is not entirely successful. Nothing that will do positive good can be recommended. Supply generous amounts of good grain and roughage. Try some warm mash to tempt the appetite. Here again, try the hot water and massage. If the animal is with her first calf and the milk is totally suppressed, examine the udder for blind teats. This is uncommon, but has been known to exist.

CHAPTER IV

DISEASES AND PARASITES OF THE SKIN

CATTLE suffer from as many different skin diseases as any other animal on the farm. They have such non-contagious diseases as warts, urticaria (rash), eczema, pruritis (itching), and wounds. These are not as important to the farmer as those diseases which are classed as parasitic. The ones seen most are lice, ringworm, scab or mange, grubs or warbles, and flies. These affections seldom cause death unless they are ignored entirely. They do much damage in reducing the general health of the herd and are a source of irritation both to man and animals.

One of the greatest hindrances in the treatment of skin troubles is the inability of the farmer to recognize the particular disease. It is much too common practice for all skin diseases to be treated from the same box of salve. The best treatment for one disease is not necessarily the best for another. There is no good cure-all for diseases of the skin. Ringworm must be differentiated from scab and treated accordingly. It would be a waste of effort to treat an animal affected with scab with an ointment designed for a simple uncomplicated eczema. Scab frequently passes for eczema and its contagiousness is overlooked. Cows affected with scab should be kept away from other animals. In some states, herds afflicted with this disease are placed under quarantine.

This chapter will deal with the common skin diseases of cattle. Before any treatment is begun, it will be best to read the entire chapter to determine just what disease is at hand. Even then, the symptoms may be confusing. It may be advisable to take scrapings from the skin and send

them to a laboratory for microscopic examination. This is usually considered too much trouble. It is, however, one of the most important requisites in the intelligent handling of a herd affected with a skin disease. It is absolutely essential to identify the disease first and treat afterward.

LICE

Lice are found everywhere in the United States. They are more frequent on farms where the cattle are undernourished and crowded into dark unsanitary quarters. As a rule, very little attention is paid to lice until the animals are literally alive with them. Lice bother cattle most during the winter months. They disappear of their own accord in the spring and summer. The heavy winter hair-coat is always a tempting place for lice to congregate. A herd badly infested with these pests is unthrifty and looks worried. This run-down and weakened condition renders the herd more susceptible to other diseases. The young animals appear to suffer most. Old animals and those in poor health are also among the first to be bothered. A lousy calf does not grow and take on weight normally during the winter months. When spring comes and the lice leave the calf, it may make better gains but much valuable time has been lost. Animals in good physical condition may have lice, but the weak individuals are the first to become infested. Lice seem to recognize their lack of resistance and attack them first. After becoming firmly established, they gain courage and seek the healthier animals. Even though lice do not cause death, they do not belong in any well-ordered herd. They are easy to destroy, if the owner does not wait too long.

Kinds of lice

There are three kinds of lice. Two are blood-suckers and the other is a biter. All do more or less biting, of course, but only two actually suck blood. The blood-suckers are called blue lice, the biting species the little red louse. As

its name indicates, the latter is much smaller than the other two. Both sucking lice are of about equal size. The adults are $\frac{1}{8}$ inch long and half as wide. One has a long nose and the other a short one. The body of the long-nosed louse is thinner than that of the short-nosed variety. Both are yellowish-brown on top and blue underneath. Each has three pairs of legs. They can be seen easily with the naked eye. The biting louse is much smaller than the blood-suckers, but can be seen without a magnifying glass. The head of this louse is very blunt and red in color. The remainder of the body is almost white. Its size, shape and color distinguish it from the other two blood-suckers. It is said that the short-nosed blood-sucking louse infests older cattle while the long-nosed one favors the young stock. The biting louse does not seem to show any decided preference. It occurs on both young and old cattle.

All lice spend their entire lives on the body of the cow. They do not leave the animal body even for a short time. Lice lay eggs called nits. The nits hatch out in about two weeks and become adult lice in another two weeks. The eggs are laid on the hair of the animal host. Cattle lice do not bother other animals. They thrive best during the winter months when the hair is long. The lice select a location on the cow's body where it is hardest to be dislodged. For this reason they frequent the neck, back and head, and the inside surfaces of the legs.

All three varieties of lice irritate the animal by biting or sucking. The sucking lice dig holes in the skin before they can suck blood. This doubtless causes annoyance to the animal. When the lice are present in large numbers, scratching and rubbing is a constant symptom. The cow licks the skin and the hair may be worn off in spots. These bare spots might be mistaken easily for ringworm and, in extreme cases where the rubbing has been continuous, the skin may become raw and sores form. If it were not for the presence of the lice themselves, mange or scab might be suspected.

Treatment

Lice are easy to destroy. Three methods are used, depending on the season of the year the treatment is applied and the number of animals affected. Treatment may be by hand applications, by spraying, or by dipping. In the winter a small herd is best treated with hand applications. In very cold weather a dry powder is best. For this purpose, two parts of powdered sabadilla seed and one part flowers of sulfur have given good results; mix the two powders and apply to the hair with a stiff brush dipped in the powder. Another winter treatment uses cottonseed-oil and kerosene, equal parts of each mixed. Crude petroleum is also employed. The cottonseed-oil and kerosene and the crude petroleum should be put on with a brush or cloth; apply a thin coating over the entire body including the inside of the ears.

In early autumn, the spray method is favored when the number of cows to be treated does not warrant the construction of a vat for dipping. A small garden sprayer will serve. Any of the common coal-tar dips on the market may be used for spraying. It is always best to follow the directions printed on the label of the container.

Dipping is the best treatment, but it will not be considered on the small farm because it necessitates the expense of building a special vat. If a large number of cows is to be treated, this is the best method. It is very effective. Anyone interested can secure special instructions on vat construction and solutions from the United States Department of Agriculture at Washington.

Whatever method is employed, it will be necessary to repeat the treatment in about fifteen or sixteen days. This is done to kill the young lice that hatch out from nits which were on the animal at the time of the first treatment. The dipping or spraying does not destroy the nits. After treating the herd, it would be well to clean the barn thoroughly to remove any lice or nits that may have dropped off in the litter. If possible, the litter should be burned. The

adult louse can live only a few days after it leaves the body of the cow. The nits or eggs survive much longer. Therefore, remove and burn all litter and spray the floors and walls to kill the remaining lice and nits. The lice that fall off on the ground or in the litter die quickly. Nits that happen to be on shed hair may hatch out in the litter and become adult lice. If these newly hatched lice do not succeed in reaching the body of the cow in a few days, they will die.

SCAB OR MANGE

Mange is a parasitic disease. It is often called scabies. The disease is caused by a species of the mange mite. The scab mite of cattle belongs to the same family as the mange mite of other animals. Mange or scab is more common in winter. It is contagious and affects cattle of all ages.

Cattle suffer from four different species of mange mites. The first is the psoroptic or common mange mite. These live on the surface of the skin. They are more frequent than any of the other kinds. The second, or sarcoptic, is more dangerous, but not so common. This mite burrows deep into the skin. The third, or chorioptic mange mite, lives on the surface of the skin. It is found chiefly on the legs and tail. The fourth, or demodectic mite, is very much smaller than the others. It digs down into the hair-follicles and sweat-glands. It is difficult to eradicate on this account. All mites are very small but usually can be seen with the aid of a magnifying glass. The skin should be scraped and scrapings placed on a piece of black paper. If the paper is held over a flame until it becomes warm, the mites can be seen more easily because they move.

The psoroptic or common mite

The psoroptic, or common mange mite, is most frequent. It is not considered as dangerous as the sarcoptic mite, but can do great harm in a herd if not promptly recognized

and eradicated. This mite spends its entire life on the body of the affected animal. The young mites hatch out and reach maturity in about twelve days. This fact is important, because two treatments are necessary about twelve days apart, to destroy those mites that hatch out from eggs after the first treatment which does not kill the eggs that are on the animal at the time.

The common scab mite may be present on any part of the body. It starts first about the neck withers and near the base of the tail. From here it may spread over the back and sides. The mites bite the animal when in search of food and leave minute cuts in the skin. The itching is intense. The cow scratches itself incessantly for relief. This itching, together with the ensuing scratching and rubbing, causes the skin to become sore and infected. Small abscesses may form. These break open from rubbing and form crusts or scabs. At first, the pimples or little abscesses may be very small. They grow larger as the disease progresses. The animal spends the best part of the day rubbing and licking itself. This causes a loss in flesh. Bare patches are seen on the skin. Death will follow unless prompt treatment is undertaken. This type of mange is contagious to all classes of cattle. It spreads more rapidly during the winter months when the herd is closely confined. The skin shows signs of mange in about two to six weeks after exposure to the mite. While the infected animal is the most dangerous source of spreading mange, the mite itself will live for a few weeks in straw or other litter and may infect another cow if taken up.

Internal remedies for common mange are not successful. This common type can be cured easily if taken in time. The best method of treatment is to dip the affected cattle in a vat filled with a solution that will kill the mites without injuring the animal. The vat may be built of concrete or wood and varies from 25 to 100 feet in length. The vat is wide and deep enough to permit the animal to swim through. The treatment of this type of mange employs the

lime and sulfur dip or the nicotine dip. Two dippings are necessary, twelve days apart. The lime and sulfur dip is made in the proportion of 12 pounds of unslaked lime, 24 pounds of flowers of sulfur, and 100 gallons of water. Place the lime in a water-tight box such as is used for making mortar. Add water enough to make a paste. Sift in the flowers of sulfur and mix carefully. Put this mixture in a big kettle or tank and add water to make 30 gallons. Boil the mixture for two hours. Allow to settle and then draw off the clear liquid. To this, add enough water to make a total of 100 gallons. The dip bath should not be warmer than 100° F.

The nicotine dip is made by using enough tobacco extract or nicotine solution to give a mixture containing not less than 5/100 of 1 per cent nicotine and 2 per cent flowers of sulfur. Enough nicotine for 96 gallons of dip can be made by using 1 pound of a 40 per cent solution of nicotine. The formula for this dip is as follows: 4/10 pound of nicotine, 16 pounds of flowers of sulfur, and 96 gallons of water. In preparing this dip, the nicotine solution and the sulfur should be mixed together with a quantity of water before adding it to the water in the vat. Use the dip at a temperature of 100° F.

Sarcoptic mange

The sarcoptic type of mange is not as common as the variety just described. It is more dangerous and much harder to eradicate. In some herds the infection may last for years. This mite, also, spends its entire life on the body of the animal. The sarcoptic differs from the first, or psoroptic mite, as it digs down under the skin. Here, egg-laying and hatching take place. The subterranean habits make it difficult to reach these mites with the customary dipping treatment. The dipping liquids do not easily penetrate deep into the under-skin canals and so destroy the mites.

The sarcoptic mite attacks the animal first on the inner

surface of the thighs, in the neck, and about the base of the tail. From here the skin over the entire body may be covered. As the mite digs or burrows under the skin, it sets up an inflammation. This causes itching, and pimple-like swellings soon form. The animal licks and scratches itself until the skin becomes raw and bare in spots. Scabs form over these raw spots. When the scabs are present in large areas over the body, it will be almost impossible to tell this type of mange from the first or psoroptic type. A microscopic examination of skin scrapings will be necessary. Later on, the skin becomes wrinkled and thrown up in folds. The animal loses flesh rapidly and, unless treated early, will die. To make sure of this type of mange, too much emphasis cannot be placed on the need for a microscopical examination of skin scrapings. Scrape the skin with a knife until the blood comes. This is necessary because these mites are deep down in the skin. If the scrapings are not deep enough, the mites may not be reached. Put the scrapings in an envelope and have them examined by a veterinarian or sent to an experiment station or agricultural college for examination and identification. This variety of mange is transmissible to other classes of cattle and to man. It spreads more slowly than the psoroptic variety. Old bulls and cows seem especially susceptible and often become infected first.

This type of mange is not as easily treated as the common kind. The mites are under the skin and difficult to reach. The dipping methods described for the common mange mite will give good results if repeated three or four times at intervals of about a week. The crude petroleum dip is the most effective. It is also the most dangerous to the animal. The vat should be filled with water and enough of the crude petroleum poured on the surface to form a layer of oil about twelve inches deep. As the animal passes through, its hair becomes coated with a layer of oil. This is used cold. One dipping is enough. The treated herd should be protected from the sun for several days. The

dipping should not be done in cold weather, as the animals are likely to become chilled.

Chorioptic mange

This is sometimes called tail mange. It is not as common as either of the first two varieties. A laboratory examination of skin scrapings will be necessary to identify it; make scrapings as described before and send them to a laboratory for examination. These mites live on the outside of the skin. They do not burrow. An animal infected with this kind of mange closely resembles one suffering from common mange. The same treatment recommended for the first or psoroptic type of mange should be used against this parasite.

Demodectic mange

The mite causing this type of mange lives in the hair-follicles and digs down into the sweat-glands. It is not very common. Deep scrapings like those made for the sarcoptic type of mange will be necessary to secure samples of this mite. There is no successful treatment. The affected cattle should be destroyed. This type of mange is similar to the incurable mange of dogs.

General recommendations for mange mites

If mange is suspected, it will be of foremost importance to find out what particular variety is causing the disturbance. If one has no clue, scrapings should be made as directed and examined. Most agricultural colleges will be glad to do this free of charge. This will positively identify the mite and serve to distinguish this disease from an ordinary case of eczema or lice. It should be remembered that a cow badly infested with lice might show skin lesions closely resembling mange. This would be especially true if the animals scratched and rubbed themselves until the skin was raw and covered with scabs. A proper diagnosis is of utmost importance. While dipping is recommended as the

best treatment, the same dip liquids can be sprayed on with the ordinary garden spray-pump. This might be done if only a few animals comprised the herd. All the animals in the herd should receive the same treatment.

After treating a herd it is advisable to clean up the barns, yards and other inclosures occupied by these animals. This should be done if they are to be put back in the same barns or lots. If possible, they should be placed in fresh quarters. Currycombs, brushes, and blankets should be cleaned and disinfected carefully to prevent re-infection.

RINGWORM

Ringworm is a contagious disease and may affect man as well as cattle. It is caused by a fungus which can be demonstrated under the microscope. Young cattle appear to suffer most. The fungus attacks the hair-follicle and eventually causes the hair to fall out. Round bare patches are seen where the hair has disappeared. The affected spot itches and if the animal can reach it in rubbing or scratching, the skin often becomes raw and scabs may form. This might easily be mistaken for mange. The ringworm patches are seen most about the head and neck. It may occur about the face and eyes.

Before treatment is begun, it will be best to be sure the disease is ringworm. Make scrapings as before directed. The absence of mites or lice will verify a diagnosis of ringworm. The treatment is simple and effective if the animal is not so badly affected as to make treatment impracticable.

The simplest material is tincture of iodine. This can be purchased at any drug-store. First, wash the skin with soap and water to remove the scales or crusts. Dry the skin with a towel and paint with tincture of iodine. Repeat each day until recovery takes place. Good results have followed bathing the patches with a 10 per cent solution of salicylic acid. Still another treatment is the use of sulfur ointment. Drug-stores have this. Apply the sulfur ointment for a day or two and then follow with tincture of iodine. If used con-

scientiously, any of the suggested treatments should give good results, providing, of course, the disease is actually ringworm.

CATTLE GRUBS OR WARBLER

Cattle throughout the United States may be infested with this insect. It has been reported in every state and appears to be on the increase. The disease is not new. It was described in Europe for many years before it made its appearance in this country, and was probably imported from there. It has been reported in bison on the western plains. Cattle suffer more than other farm live-stock. Horses have been infested with the grubs. A few cases have been reported in man. Many farmers, whose cattle are badly affected with grubs, will testify that they have never seen the fly responsible for this disease. The name grub refers to the larval stage of the warble-fly. This stage is reached under the skin of the affected animal.

Cause

Two species of flies cause this disease. One is technically called *Hypoderma bovis* and the other *Hypoderma lineata*. The names may be forgotten, but they will serve here to impress the fact that two distinct species of flies may cause grubs. The flies are well distributed over the United States. Certain sections seem to favor one species more than the other.

To understand just how the grubs come about, it will be necessary to learn the life history of the warble-fly. Both flies have essentially the same mode of development. The flies may appear as early as May in some parts of the country. The open season is between May and September. The cattle are on pasture. Suddenly an animal is observed to bellow or snort and wave its tail in the air and start wildly on a run across the pasture. Other animals may be seen to do the same. The reason for the sudden activity is the attack of the warble-fly. The fly moves swiftly toward the

animal and attempts to take it by surprise. It tries to reach the heels or the hind leg. If it strikes, it sticks long enough to deposit its eggs on the hair. The fly does not make much noise as it approaches the animal, but the cow is probably supersensitive and is able to hear the approach even though man can detect no sound. Usually the animal tries frantically to reach some shaded place. Once there, the flies do not molest it. Sunny places favor the attacks of the fly. They are sometimes called heel-flies because they attack this part of the animal most. Animals which are harassed by these flies are sometimes referred to as gadders because they are continually on the move in an attempt to keep off the flies.

The eggs hatch out in two to six days. After hatching, the little worms or larvæ crawl down the hair-stalk and attach themselves to the skin. They now begin to bore their way through the skin, which may be done in one hour and a half. Not much is known about these worms after they get under the skin. They travel about inside the animal's body for several months. Many of them have been seen inside the walls of the gullet. After a few months of wandering inside of the cow, the larvæ start on their return trip. They reach the skin of the back about the first of January. When they arrive under the skin of the back, a swelling is noticed. This increases in size and soon comes to a head. The larvæ increase in size, also, until they burst through the skin and emerge. After the swelling reaches its maximum size and the larvæ are about ready to come through, it takes only a few minutes to reach the outside of the skin. The released grubs then drop to the ground. They find attachment under some nearby object and soon complete their development into adult warble-flies. They are now ready to start out in search of other cows, deposit eggs, and thus start another life cycle.

Grubs cause more damage than is generally believed. The reasons for losses are, first, the annoyance caused by the flies during the time they are depositing the eggs on the

hair of cattle; second, the irritation following the appearance of a number of grubs under the skin of the back. It has been demonstrated that if the larva or grub is crushed while under the skin and about to emerge, this will sometimes cause the death of the animal. Packers, butchers, and dealers in hides complain of the great number of hides ruined by the numerous holes punched through the skin. These losses are said to total from \$5,000,000 to \$10,000,000 a year. Other ill effects of the attack of the warble-fly are the loss in milk-flow and flesh by the gadding of the cows during the fly season.

Prevention and treatment

Certain facts are known about the flies causing warbles that may help in keeping down the number of grub-infested cows in the herd. Neither species of warble-fly stays long on the cow, usually just long enough to deposit the eggs. The fly goes straight for the legs of the cow, deposits the eggs, and leaves. It does not feed on the skin of the animal. This makes the use of fly repellents of very little value. Experiments were tried during the fly season, but the amount of infestation was not reduced materially. It would appear, then, that fly sprays are of little value in preventing grubs.

The warble-fly does not attack an animal in a barn or other shelter. This is also true of some densely shaded places. When animals are harassed by the flies, they often seek the shade of trees or stand belly deep in a creek. If the herd could be housed during the summer months, the grubs would soon disappear. This, however, is not practicable on the farm. Flies have been seen to chase a cow to the entrance of a barn and then give up the chase as soon as the animal got inside. The flies seem to require bright sunlight for their operations. They are not seen much on dark or cloudy days.

Medicinal treatment is worthless. The grubs may be pressed out with the fingers. They should always be

destroyed after removal, so they will not hatch out and become flies to carry on the disease. Certain drugs and chemicals have been tried to destroy the grubs when under the skin of the back. Kerosene and carbolic acid will kill some of them, but there is also injury to the hide and the animal. Nothing in the way of treatment gives much encouragement except to try to squeeze out and destroy as many of the grubs as possible. It is useless to try to prevent the cows from coming in contact with the warble-fly under ordinary farm conditions.

Investigations have been begun to ascertain whether the arsenical dips used for the eradication of the Texas fever ticks will have any beneficial effect in controlling this pest. It is thought that the arsenic which remains on the skin of the animal after dipping might hinder the tiny worms as they make their first entry into the body.

FLIES

Cattle flies are distributed universally. The two that bother cows most are the stable-fly and the horn-fly. The fly problem is serious. It has troubled the farmer for a long time. Much money has been spent uselessly on various preparations advertised to keep flies off cattle. Flies cause untold irritation to a herd of dairy cows during the summer months. It would be difficult to estimate the extent of the loss in dollars and cents. During July and August when the fly season is at its height, it is not uncommon to see animals almost blanketed with flies. It is cause for wonderment that a cow is able to exist under such conditions. In fly time no one looks forward to milking. The cows are nervous and irritable. After milking an animal or two, this state of mind is soon transmitted to the milker. It would be a boon to the dairy business in general if some reasonably sure means of relief could be found. Repellents help but their benefits are fleeting and the herd owner soon tires of the continuous treatment necessary. Besides, continued treatment is expensive.

Both of the common flies attacking cattle are blood-suckers. Both are common wherever cattle are raised. The stable-fly resembles the house-fly. It has similar breeding habits. Stable-flies are present in greatest numbers with the coming of warm summer weather. This is usually after May or June. The fly lays its eggs in horse manure. They may, however, be deposited in other places. The eggs hatch in three or four days. Much depends on the prevailing weather. Warm weather hastens hatching. After hatching, the larvæ look like maggots. In about three weeks they become adult flies. The stable-fly bites while the house-fly does not. The former are sometimes mistaken for house-flies when they are found in the house.

Horn-flies are frequently seen in clusters about the base of the cow's horns. They do not injure the horn in any way. They merely gather there to rest after an arduous day biting cows. The horn-fly lays its eggs in freshly dropped cow manure. The eggs hatch in about twenty-four hours. The entire process of development of the horn-fly takes two weeks from the time the eggs are deposited in the cow manure until they become full-grown flies. The bite of the horn-fly is not as severe as that of the stable-fly. The feebleness of the bite, however, is more than made up by the numbers of flies. They attack cows in hordes and at times may nearly cover the sides of an animal.

Remedies for flies

There is no sure preventive for flies. Nevertheless, every now and then some new and guaranteed product is advocated. The most widely advertised failure of recent years was called fly salt. This salt was medicated with some drug, probably sulfur. It looked just like any other salt. Animals were to have free access to the salt for about a month before the fly season arrived. After that time no fly would bother the animal. This salt was purchased by thousands of farmers. It never kept a solitary fly from any cow.

Extravagant claims are made for many of the commercial

fly sprayers. Many are good for a few hours, but are expensive when used for any length of time. Home-made mixtures of various sorts will do fully as well. The best spray will keep flies from an animal for only a short time. The odor will hold the flies off for a while, but they soon become ravenously hungry. Hunger reduces their dislike for the odor of the spray and they attack the animal. The odor naturally wears off after a few hours. Some sprays are claimed to be effective for as long as a week. Claims such as this cannot be substantiated. Any fly spray should be applied once a day, either at night or in the morning. Care should be taken not to use too heavy an application of the spray liquid or the animal may lose its hair. Do not soak the hair until it drips. This will injure the animal and spoil the milk besides.

A simple home-made spray may be made up by mixing 2 gallons of waste crank-case oil with 1 pound of naphthalene flakes. This mixture does not cost much. It should be used sparingly. Too heavy an application will burn the hair and skin. Another simple mixture is made of 2 gallons of coal oil and 1 pound of naphthalene flakes. Use this night and morning as a fine mist. There are many other more complex solutions. They are no better and cost more.

Whenever trouble follows the use of any fly repellent, it is always traced to a too generous application. If used sensibly, no ill effects are likely to follow. If possible, all accumulations of manure where flies breed should be removed. This will help to reduce the numbers.

SCREW-WORMS

Screw-worms are nothing more than fly maggots. Someone in days gone by thought the maggot looked like a screw and the name has been retained. The fly that lays the eggs which develop into the screw-worm maggot is bluish-green in color and about $\frac{1}{3}$ inch in length. Decayed or rotten odors always attract this species of fly. In such decayed

or rotten material the fly may deposit as many as 400 eggs at one time. Barbed-wire cuts that have become infected are favorite places for eggs to be laid. Castration wounds that are allowed to become foul are often infested with this maggot. This is a common occurrence on any farm where many hogs are castrated in midsummer. When cows are dehorned in fly time, the wounds are sometimes slow to heal and the eggs of the screw-worm may be laid in the hole left by the removal of the horn. The maggots develop inside the head and may enter the sinuses and cause serious after effects. They are very difficult to remove from a horn wound. The eggs are laid in open wounds. They hatch out in a few hours into maggots. The maggots burrow into the wound and feed for a few days. After this they drop to the ground and develop into mature flies in about two weeks.

Any animal on the farm may become infested with screw-worm maggots. They may enter any wound. The navels of new-born calves often become infested.

Prevention and treatment

The carcasses of dead animals must not remain unburied. These attract and furnish a breeding place for screw-worm flies. All decaying animal and vegetable material should be disposed of as promptly as possible. In the case of an anthrax carcass, this would be absolutely necessary.

If the district is heavily infested with screw-worm flies, special care must be taken whenever any surgical operation is performed. This applies to branding, marking, castration, docking, and dehorning. After branding, a small quantity of cottonseed-oil should be rubbed over the burn to hasten healing and to keep off the flies. All open wounds on animals should be watched and cleaned daily if necessary. Ill-smelling wounds attract the flies. It is best not to dehorn in fly time. If it must be done, the dehorned animals will require extra care. After the horns have been cut off, the stump should be smeared over with pine tar:

soak a piece of cotton with the tar and stick it over the stumps. The flies do not like the odor of the tar. The tar will also aid in healing. Wire cuts and similar wounds should be treated with simple antiseptics and observed daily. Lambs may suffer from screw-worm maggots after docking. This can be prevented by docking with the heated pincers method. If a knife is used for docking, the stump of the tail should be smeared with pine tar.

WARTS

Warts are tumors of the skin. They often affect an animal about the head and neck. Small warts are also found on the udder and teats. One or two seldom cause any trouble. At times they occur in large numbers and are very unsightly. Warts may be single or in clusters, affecting relatively large areas of the skin. In rare cases they may resemble a bunch of grapes. Some cattle have them in such large numbers as to interfere with the general health of the animals. Warts are sometimes present on the sheath of a bull. This may hinder the breeding ability of the animal. The warts are frequently red in color. When rubbed, they bleed and become raw sores.

If the warts are small and few in number, they may be clipped off with scissors and then seared over with a hot knife-blade or stick of lunar caustic. A long thin wart may be tied off with a piece of silk fishline. The line is tied tightly about the base of the wart, which after a few days will drop off. Some warts will disappear after a few applications of olive oil. In rare cases an animal has innumerable clusters of warts about the head and neck. If not of great value, it would better be disposed of.

ECZEMA

Eczema is not contagious. It begins as a simple inflammation of the skin. It is accompanied by more or less itching. If this continues, the skin becomes reddened and pustules or blisters may form. These are followed by the

formation of crusts with thickening and wrinkling of the skin. Eczema is more common in horses than in cattle. In cattle it is usually caused by insanitary surroundings. Warm and damp barns might cause it. Eczema may follow when an animal is forced to lie in wet litter. Improper feeding has been known to cause eczema.

Eczema is usually indicated by itching and a watery discharge from the skin. There may be pustules or vesicles on the skin. These often become infected and suppurate or form pus. The animal rubs continually, making the skin raw in places. The skin thickens and sometimes cracks, leaving open bleeding fissures.

Before treatment is begun, one must eliminate such diseases as mange or lice. Scrapings from the skin should be taken. An examination of this would indicate the presence or absence of the mange mite. If lice were at the bottom of the trouble, a close examination of the skin would reveal them. After it is determined that the disease is not contagious, local applications to the skin are in order. The skin should not be washed with soap and water. This will increase the irritation. Soothing lotions, such as a warm boric acid solution, are beneficial. The boric acid solution is made by dissolving a teaspoonful of boric acid powder in a pint of warm water. This will relieve the itching and help to dry the surface of the skin. After bathing the skin, apply benzoated zinc ointment once daily.

PRURITIS (ITCHING)

This is a condition rather than a disease. It is usually caused by filthy surroundings. Dust and dirt of various kinds collect on the skin, causing a local irritation which results in itching. When the stalls are located under a hay mow or straw loft, particles of hay and straw or dust filter through the ceiling and fall on the animals. Certain feeds are said to cause itching sensations. Food rashes are common in man. In cattle, this is usually guessing, as no particular feeds actually are known to cause it. Intensive

feeding methods and close confinement are given as other causes of itching. Scratching may become a habit with some animals. Almost anyone will testify to the rather delightful sensation that comes from rubbing a spot that



FIG. 3.—Result of a wire cut. Such wounds are serious and should receive careful attention. Note swelling and discharge of pus.

itches. Cattle may enjoy the process and form the habit of continual rubbing.

Treatment consists in removing the cause, if this should be insanitary or dirty housing conditions. The affected cows should be groomed frequently. For external applications $\frac{1}{2}$ ounce of carbolic acid in a quart of water will bring relief and cool the affected parts.

URTICARIA (RASH)

This is a mild inflammation of the skin. It is not very common. It usually develops rapidly in the form of swellings from the size of a nickel to as large as one's hand. The

swellings resemble welts which rise after mosquito bites, only they are much larger in area. The patches of swellings may appear suddenly and then disappear almost as quickly. It is thought to be due to some digestive disturbance or a functional disease of the kidneys. Some authorities think it is a nervous disease.

Treatment is not often necessary. It would do no harm to give the animal a pound of Epsom salts to make sure of bowel movements. If the swellings persist, they may be bathed with warm water, in which has been dissolved ordinary baking-soda, a tablespoonful to a quart of water.

WOUNDS IN THE SKIN

Wounds should be cared for at once (Fig. 3). This is especially important in warm weather to prevent infection with the screw-worm maggot. A small cut in the skin should be washed with any good household antiseptic. If the wound is deep, it would hasten healing to pour some fresh hydrogen peroxide into the wound opening. This would aid in flushing out any foreign matter and cleanse the wound. If the wound is large and gaping, it will be best to secure the services of a veterinarian, who will clean and sew the edges of the wound together. Most simple wounds will heal quickly if they are kept clean. Any good dusting powder can be used to dust over the wound after caring for it. A dusting or healing powder can be obtained at any drug-store.

CHAPTER V

CALVING TIME AND BREEDING TROUBLES

THE impending arrival of a calf in any well-conducted herd is always a matter of concern. Fortunately, most calves are born normally and require little, if any, assistance in bringing them into the world. Sometimes the birth of a calf is delayed for various reasons. Neighbors are frequently called in consultation to decide on what should be done. It may be that the passage of the calf is only half accomplished and help is needed to complete the birth. If assistance is necessary it should be efficient. Stout ropes are often tied to the half-born calf and an attempt made to remove it forcibly. A team of horses or a wire fence stretcher have been used for this purpose.

Calves often fail to pass out naturally because of some unusual position in the birth canal. If this faulty position is not corrected, no traction will pull the calf out. The calf may have become twisted, its head may be turned backward or its legs may be crossed or bent in such a manner as to prevent regular calving. Unless the calf is straightened out and placed in the normal position of head and feet forward, pulling will only serve to aggravate the trouble. If this is not done, the birth will usually end in death to the calf and perhaps the mother.

After calving is over, another normal and natural act usually takes place without hindrance. This is the passage of the membranes that covered and nourished the calf during its stay inside the mother. These membranes are called afterbirth or placenta. When these membranes are not expelled within twenty-four to thirty-six hours after

the birth of the calf, the condition is called retained after-birth or placenta. Trouble always follows retention of the afterbirth. It affects the health of the animal and if it is permitted to remain for several days serious after effects follow. When everything goes smoothly, the placenta is released a few hours after the calf is dropped. Most cows do this of their own accord. When the afterbirth does not come naturally, it should be removed by hand before it decays. After twenty-four hours decomposition is likely to begin.

In any community there is always some one with a local reputation for skill in such matters. Many times this person, either from experience or instruction, is clever in removing a retained afterbirth. Many farmers do it themselves and take pride in their accomplishment. Often, however, infection may follow the unskilled or careless operation. Danger always attends this procedure. The membranes may be putrified or ill-smelling. A fatal infection might easily be caused in both man and animal.

The removal of an afterbirth, in most instances, should be delegated to the local veterinarian. The expense is often an objection, because the operation is not considered serious. The proper removal of an afterbirth, especially one that has been long retained, requires very delicate handling. Many animals have been lost or rendered unfit for further breeding by crude attempts to perform this operation. The days of unskilled midwifery are rapidly passing in human medicine. It will be fortunate for the health and well-being of farm live-stock when skilled attention is given at such times as delayed or difficult calving and failure to pass afterbirth normally. This advice is given with the best interests of the careful and intelligent breeder at heart.

CALVING PREPARATIONS

On most farms the cow about to calf is not given any special care. It is always good herd management to be careful about diet for at least a few weeks before the cow

is due to come in. She should be given easily digested feeds. The quantity of hay should be reduced somewhat and bran mashes fed occasionally to keep the bowels in good condition. The animal should not be fat, but rather lean and fit. Such feeds as wheat bran and middlings are especially desirable because of their high percentage of lime and the phosphates. These feeds will also tend to promote milk secretion and build bone in the developing calf. If there is any tendency toward constipation, a dose of Epsom salts will relieve it and perhaps prevent an attack of milk-fever a few days after the calf arrives. A thousand-pound cow will take about one pound of Epsom salts: dissolve this amount in warm water and administer from a long-necked bottle; be careful not to choke the cow and allow the liquid to run into the lung; place the bottle in the corner of the mouth and let the animal swallow naturally.

An animal due to calve in the winter months should be given as much exercise as possible. If the barn and equipment permit, the cow should be removed from the herd and given a box-stall to herself. A nervous animal will be greatly benefited by the seclusion. On most farms cows calve wherever they happen to be. Farmers interested in good herd care will find a box-stall for an animal about to calve a step in the right direction. If the animal should abort, this separation will make it easier to prevent the possible infection of other animals in the herd. If the box-stall is kept clean and well bedded with straw, the calf will have a better chance to survive. Digestive disturbances, such as scours and navel infections of new-born calves, would be much less frequent under these circumstances.

WHAT TO DO WHEN THE CALF ARRIVES

The average cow carries its calf about 285 days. Mistakes are often made in the breeding dates of an animal and for this reason calving does not always occur on schedule time. It would be a good plan to keep a record book for the express purpose of entering the breeding dates

of the different animals in the herd. It is worth the small effort involved.

The symptoms shown by an animal about to calve are simple. The udder increases in size. The flesh about the rump appears to fall away. The muscles at either side of the base of the tail sink or cave in. A sticky discharge from the vagina or external genital organ is often noticed. If calving takes place in the summer, the animal will stop grazing and seek a secluded part of the pasture. When under close observation, a cow will show uneasiness by lying down and getting up frequently. As calving time draws nearer the animal may moan, move restlessly to and fro, and begin to show signs of straining. When the pains of labor start, the back is arched, the croup droops, the abdomen draws up and the labor pains become stronger and come at shorter intervals.

A normal calving should cause no excitement. Nine times out of ten the cow will do her duty without help of any sort. One should not interfere unless the further progress of calving seems unlikely. Perhaps after an hour or two an examination should be made to determine whether the calf is coming in the regular position of front feet and head forward. If there is any deviation from this position, it will be necessary to push the calf back and adjust it so that it can come easily. Before doing this the hands and arms should be washed carefully, so as not to carry any infection into the animal. The finger-nails should be trimmed closely to prevent any injury to the delicate lining of the vagina and womb. This operation is sometimes performed by the owner or a neighbor who has had some experience. If the calf is not easily straightened, the best advice would be to secure expert help. When two or three hours have passed from the time the animal started to labor, outside help should be sought. Never wait until the cow is exhausted. Do not try to pull the calf out with ropes without first putting the calf in position to come.

Abnormally large male calves are born with more or less

difficulty and frequently the mother requires assistance. Calving is often hard with heifers carrying their first calf. Some cows are too fat. In others the pelvic bones do not have enough elasticity to allow the free passage of the calf. In most cases, the cow will do the job as nature intended and only an occasional one will need help. When this is needed, try to give her the best and most intelligent aid available. Some cows calve standing while others calve lying down. In a standing birth the navel cord will probably break as the new-born calf drops to the ground. If the mother is lying down at the time of birth, the cord will be broken as soon as she rises to her feet.

AFTER CALVING DUTIES

If an animal is exhausted after the calf is born, a home-made stimulant is sometimes of value. This can be supplied in the form of a quart or two of strong black coffee. It should be remembered that the cow is in a very weakened condition and careful attention should be paid to her diet. Lukewarm water is best for drinking. When she shows any desire for feed, a bran mash should be given. If the barn is cold, a blanket will aid in keeping up her spirits. Good care at this time will be an incentive to prompt passage of the afterbirth. As soon as the afterbirth is expelled, it should be removed before the animal has opportunity to eat it. This in itself may not cause any trouble, but it is not considered good practice.

The time of the first milking after calving will depend on the condition of the udder. The calf will take enough of the first milk so it may not be necessary to milk the animal even in part until after twenty-four hours. It is best not to milk the udder out fully at any one time for three or four days after calving. This is thought to have a bearing on the prevention of milk-fever. After two or three days the cow may be introduced gradually to the regular feeds. About two weeks will elapse before she is on full feed.

A new-born calf does not require much attention. The mother takes care of it in her own way. She dries it by licking immediately after it is born. If for any reason she does not do this, the calf should be dried with cloths. The face of the calf should be examined to make sure no membranes interfere with its breathing. Sometimes portions of the afterbirth adhere to the nose and mouth and in rare instances may smother the calf. It will not be long before the calf acquires strength enough to stand on its feet and nurse for the first time. It will be very wobbly at first. Sometimes a very weak calf will need assistance. The first milk from the cow is essential to the welfare of the calf. It should always receive it. This milk is called colostrum. It contains laxative properties which aid in starting off the digestive processes properly. One should not neglect to dip the calf's navel cord stump in a tincture of iodine solution. This may prevent scours or pneumonia. In warm weather when calving takes place in pasture, the navel should be watched to prevent infection with screw-worm maggots.

FEEDING THE CALF

As stated above, the new-born calf must have the mother's first milk. This is nature's best physic. Leave the calf with its mother for the first two or three days of its life. Keep the mother and calf in a clean and well-bedded place. The first few days of a calf's life are very important.

When the calf is taken away from the dam, it will have to be taught to drink. After twelve hours the calf will usually be hungry and will then be in a frame of mind to learn to take milk from a pail. Most of them will drink readily. Be certain the milk and the pails are clean. Do not over-feed the calf. Most farmers are likely to do this. It is far better to feed too little than too much. Give the calf from 6 to 12 pounds of whole milk daily. The amount will vary with the size of the calf. During the first two weeks the daily amount should be divided into three parts

and fed three times a day. Weigh or measure the milk accurately each time.

After two weeks, change from whole to skim-milk. Do not change suddenly, but take about a week to make the complete change. Continue the skim-milk feeding until the calf is six months old or even older, if the milk is plentiful. Sixteen pounds daily should be sufficient. When the calf is two or three weeks old it may be taught to eat some grain and hay. If it runs with other calves it will learn before this age. The first grain fed may be either cracked corn or whole oats or a mixture of the two. Any combination of the ordinary farm grains may be fed satisfactorily with the milk. Do not feed over 2 pounds of grain a day up to the time the calf is weaned. During this period the calf may have all the clover or alfalfa hay it will eat. Never feed silage before the calf is six months old.

If the herd owner wishes to apply modern methods to the management of his calves, it is always best not to permit the young calves to be put on pasture until they are six months old. It has been found that they do much better when left in the barn for the first six months. Here they are not subjected to the attacks of flies and, what is more important, they are on regular feed and grow much faster. Many hundred-dollar calves are stunted each spring by allowing them on pasture too soon. The calf's quarters should be kept clean and well lighted. Plenty of fresh water should be available.

CALF SCOURS AND PNEUMONIA

If all calves were taken care of as just described, scours and pneumonia would not be so common. When calves are allowed to shift for themselves, these two diseases are often encountered. Certain types of calf scours are associated with abortion disease. It occurs more often, however, not as a symptom of abortion but as a result of over-feeding and filthy living conditions for the young calf. Dirty milk fed from dirty pails is a common cause of this trouble. A calf

that has scoured for several days usually dies. A calf only a few days old does not have the strength or vitality to withstand an attack of scours very long. Scours must either be prevented or taken in hand very quickly after it starts.

A calf fed as directed will not be likely to scour from over-feeding. If no attempt is made to regulate the diet, scours may follow. If so, this should be corrected at once. Even though the appetite of the scouring calf remains good, the milk ration should be reduced. If the over-feeding is continued, death is sure to follow. It might be good practice to withhold all feed for twenty-four hours. This will give the digestive organs a needed rest. First of all, put the calf by itself so that other calves will not lick the discharges. This is very important. A diarrhea is always caused by an irritation of some sort in the intestines. The calf has a diarrhea because its bowel is overloaded with an indigestible mass of milk-curd. This sets up an irritation which results in scours.

Treatment will be very simple. Take away all feed. Next, try to eliminate this accumulated food in the intestines. This can be done with a dose of castor oil. Give from 3 to 5 ounces, depending on the size of the calf. After this, something will be required to allay the intestinal irritation. Give an ounce of common baking-soda in half a pint of warm milk twice daily. Keep the litter as clean as possible. When the diarrhea has ceased and the calf appears brighter, it may gradually be put on full feed, as outlined under calf feeding. It should not be forgotten that no amount of treatment will save a calf that is exhausted after a long siege of scours. Age does not give it very much resistance and its strength dwindles rapidly. This also applies to pig scours and the young of all animals.

Pneumonia usually occurs when the calf is a month or two old. It sometimes appears as an infectious disease. Scours and pneumonia may be present at the same time. Careful disinfection of the navel of the calf shortly after birth is helpful in preventing this disease. Dip the navel

in pure tincture of iodine as soon as possible after the calf is born. Pour the iodine into a tumbler and, while the calf is standing, immerse the stump of the navel in the iodine solution.

Calves affected with pneumonia or scours carry a high temperature. There is rapid breathing and all the other outward signs of congestion of the lungs. Treatment is essentially the same as for an uncomplicated case of scours. Withhold feed for twenty-four hours. Administer castor oil in 4-ounce doses. Place the calf in a dry airy place by itself. Give barley water or barley gruel for nourishment. Allay intestinal irritations with baking-soda in 1-ounce doses dissolved in milk. Treatment for a combination of scours and pneumonia is not a great success. Good nursing is very important. Careful handling of the new-born calf with disinfection of the navel, together with proper feeding, will prevent scours and pneumonia. At present, not much dependence can be placed in the various vaccines and serums for these diseases.

RETAINED PLACENTA OR AFTERBIRTH

Afterbirth and placenta are the same. Fortunately, most cows expel the afterbirth on time. On the other hand, some cows require assistance. A long and exhausting birth ordeal might leave the animal in such a weakened condition as to make the normal passage of the afterbirth impossible. Retained placenta may occur as a symptom of contagious abortion or it may not be complicated with that disease.

Cows in good physical condition stand a much better chance to avoid this trouble. For this reason, it is highly essential that the animal receive good treatment before calving. This applies to feed and general care. The diet should be restricted as described under calving preparations. On most farms no attention is given the animal in this respect. Other factors may cause an afterbirth to be retained. The animal is often very weak. The womb may have lost its power to contract or shrink, thus causing the placenta to

remain inside. Old cows frequently suffer more than young animals because of a general lack of vigor. The neck of the womb sometimes closes before the placenta has had time to pass through.

Most afterbirths pass within a few hours after the calf is born. If this does not take place within twenty-four hours, it should be removed by hand. A veterinarian should do this work. Many cows have died as a result of careless attempts to remove afterbirths. Dirty hands and dirty irrigating tubes will aggravate the infection. The afterbirth is attached to the inside wall of the uterus or womb by means of cotyledons, sometimes called buttons. The buttons are a part of the wall of the uterus. If they are twisted off when the afterbirth is pried loose, the death of the animal is sure to follow. There are fifty or more of these cotyledons or buttons. These attachments serve to hold the growing calf in its proper position and it is through them that blood and nourishment are carried from the mother to the calf. When the placenta fails to loosen and become detached of its own accord, help must be given. When one unbuttons an overcoat, he does not pull off the buttons on the coat. This should also be true in the removal of an afterbirth. Great care must be exercised in this respect.

A recital of the symptoms shown by a cow suffering from retained afterbirth is hardly necessary. Portions of the membranes may be seen protruding from the external genital organs. There is often an offensive discharge. If the placenta is long retained, the animal becomes depressed and there is loss of appetite. The cow will also carry a temperature of varying degrees. The owner may think the afterbirth has passed and may be at a loss to understand the reason for the animal's sickness. Half of the placenta may have passed, but enough remains to cause trouble. An examination of the animal would reveal that a portion of the placenta remains.

The usual home treatment, when the owner does not attempt hand removal, is to tie a brick to the protruding

portion of the afterbirth. This is done in the hope that the membranes will loosen of their own accord and that the constant pull or dragging of the weight will help to separate the afterbirth from its attachments inside of the womb. This in turn will cause the womb to contract and thus hasten the expulsion of the afterbirth. Some have tried a simple twisting method. This is to tie a stick to the protruding portion of the placenta and wind it up as far as it will go. Then, by careful twisting the afterbirth may be slowly wound up on the stick and ultimately removed. Both of these methods are crude at best and often do not succeed because the afterbirth is likely to be much decomposed and breaks off easily.

The following method is given to aid the farmer who wishes to perform the operation himself, or who cannot secure the services of a veterinarian. The removal should be done within thirty-six hours after calving and before the opening into the womb has had time to close.

First, strip down to the waist. This will prevent soiling the clothes unnecessarily. Wash the arms carefully with soap and water. Trim the finger-nails short and be sure there are no cuts or scratches on the hands or arms. This would be an easy entrance for infection. Grease the right arm with carbolized vaseline, which can be secured from any drug-store. Have some one at hand to hold the cow's tail to keep it out of the way. The operator now grasps the protruding portion of the afterbirth with his left hand. The right hand slides up along the afterbirth on into the vagina and enters the cow. Follow along the placental membrane until the hand enters the opening into the womb or uterus. If this is partially closed and difficult to enter, proceed slowly and introduce two or three fingers at a time until it can be spread open enough to gain entrance. The left hand which holds the placenta will help to keep it stretched tightly and will supply traction as the membranes are loosened with the right hand.

When the right hand is inside of the womb, feel along the

placenta until the first cotyledon is reached. Go slowly at this point. Do not pull off the buttons to which the membrane is attached. Remember the comparison with the overcoat button. The attachment of the placenta to the button is usually easy to detach if one goes about it slowly. Take plenty of time. During the operation the animal may arch her back and squeeze the worker's arm. Have the assistant pinch the cow's back to stop the straining. Peel the membrane off the button as you would peel an orange with one hand. Some peel easily and some require considerable time before they can be detached. As soon as one button is freed, move on to another. Keep the membranes tightly stretched with the left hand and pull slightly to remove that part of the afterbirth already loosened. One by one all the attachments are peeled off until the placenta is entirely removed.

If there should be a large quantity of foul-smelling liquids left in the uterus, it may be cupped out with the hand. Should this not be satisfactory, the womb may be washed out with a mild salt solution. Do not use strong disinfectant solutions for this purpose. They do more harm than good. Make up a gallon of a warm salt solution by dissolving 2 small tablespoonfuls of common salt in this amount of water. Secure a piece of rubber tubing about 8 feet long and $\frac{1}{2}$ inch in diameter. The ordinary household douche outfit will serve the purpose. The rubber tubing should be boiled before use. Grease the arm again and carry the soft rubber tubing into the inside of the womb. First pass the hand carrying the tube into the vagina. Keep on going until the uterus is reached. Extend the tube to the lowest point in the uterus. Have the assistant place a funnel in the outside end of the tube and hold it high. The salt solution is then poured into the funnel and allowed to flow into the uterus. After the entire amount of salt water is introduced, it is siphoned out at once by dropping the outside end of the tube to the ground. Gravity will then remove the liquids. Keep the arm inside, while this operation is going on, to

wiggle the tube about if it should become clogged. Sometimes siphoning is unnecessary because the animal will usually arch her back and by straining throw out the wash solution. If there is any discharge later on the irrigations may be repeated. Use the same sanitary precautions each time. If the legs and tail of the cow become soiled with the discharges, they should be bathed. Such an animal should be kept by itself so that other cows and calves cannot lick the discharges.

This sounds very simple. It is, when there is experience and confidence to back it up. After the afterbirth is removed and the animal cleaned, be sure to wash the arms carefully and then use any good household disinfectant to cleanse the skin to prevent infection. Infection might appear on the operator's arm in the form of boils. This should be watched carefully especially if the afterbirth was putrid.

PROLAPSE OF THE WOMB (CASTING THE WITHERS)

The popular term for eversion or prolapse of the uterus is casting the withers. When a calf is born without undue straining on the part of the mother and the afterbirth comes away promptly, the uterus usually contracts immediately. Some animals do not fare so well. Young heifers seem to suffer most. On the other hand, many cows throw out the womb as a regular part of their calving program. This is due to a general weakness of the uterine muscles which causes them to contract very slowly.

Nothing in the way of mishaps at the time of calving or afterward is so likely to frighten the owner. The animal actually looks on the verge of turning herself wrong side out. What actually happens is this—the straining causes the weakened uterus to move backward and pass out through the vagina or external genital organ. It would be about the same if one were to turn a pocket in a pair of trousers wrong side out. The womb may be partially prolapsed or it may be entirely outside the animal. The real cause of the eversion is the excessive straining of the cow. When

the womb is entirely turned out, the buttons or cotyledons on the wall may be easily recognized. If the prolapsed womb remains out for a long time before it is discovered by the owner, the chances for a good recovery are slight. It usually is torn and bleeding. It may be dark red or even black. When the animal is alone in a barn, rats and cats have been known to nibble at it.

As soon as the prolapse is discovered, professional help should be sought. The replacement is difficult and whenever possible should be left to an experienced person. While waiting for help to arrive, something can be done to clean the protruding portion of the uterus. If the cow is lying down, the womb should be raised and a clean towel or sheet placed under it, and washed carefully with cold water. This will aid in decreasing the blood supply to the part and reduce the swelling. Afterward it should be bathed with a boric acid solution, about a teaspoonful of boric acid to 2 quarts of water. By this time help will have arrived.

If assistance is not available, something must be done to relieve the animal. In dealing with accidents of this sort a certain amount of risk accompanies the relief operation, especially when one has had little or no experience. With this in mind, the following suggestions are offered. First, wash the womb as directed. Get the animal on its feet. It is always difficult to work to any advantage when the cow is down. Put her in a stall or some other place where her movements can be controlled. Raise the hind parts as high as possible. This can be done by building a pile of straw or litter under the hind feet. Have the head and shoulders of the animal as low as possible. A simple platform of some sort could be devised to raise the hind parts higher than the shoulders. This will help to prevent further prolapse and aid in replacing the womb. Straining may be lessened by passing a rope under the belly and up over the back. Pull the rope girdle tight to prevent the back from arching.

After the animal is in proper position and cleaned, the

operator will need to prepare himself. The right arm should be washed and greased with vaseline. When the animal strains violently it is often necessary to administer a sedative, such as chloral or chloroform. This is dangerous when attempted by an untrained person. The continual straining makes replacement difficult. The assistant may pinch the animal's back to keep her from straining excessively.

One of the chief drawbacks to rapid replacement of the womb is its swollen condition. It may be twice its normal size. Strong disinfectants will increase the swelling. The less the uterus is irritated, the better the results. The same precautions that apply to the preparations for the removal of an afterbirth are necessary here. Watch for cuts on hands and arms and have the finger-nails short and smooth. Use the left hand to support the protruding mass. If the womb is entirely everted, the mass may need more than the uplifting pressure of the left hand. Double up the right fist with the finger-nails turned in. Beginning at the part nearest the body of the cow, start to push the womb back into place. Do not allow the cow to lie down. This may require fortitude on the part of both animal and helpers. The cow will strain at regular intervals. Between these periods of straining, work fast and keep pushing or feeding the womb backwards. When the animal is felt to start straining again, cease further efforts but hold the fist and arm in place to prevent losing whatever progress has been made. Between the intervals of straining and resting, the uterus will gradually be replaced.

This is more difficult than it sounds. It is slow painstaking labor. Sometimes the womb is almost all back in, only to be thrown out by a sudden strain when the worker relaxes vigilance for a moment. After the womb is in its proper place, it may be necessary to introduce a gallon or two of water to iron out the wrinkles on the inside. Make up some salt solution using 2 tablespoonfuls of salt to the gallon of water. With a piece of half-inch rubber tubing

and a funnel, the solution may be poured into the uterus. Carry the sterilized tube into the uterus with the right hand, and instruct the assistant to pour in the liquid. This must be siphoned out by letting the outside end of the tubing drop to the ground. This will permit the solution to run back out by gravity. If the solution is not removed immediately, the animal may strain and the work will have to be done over again.

After the womb is replaced it must be kept there. Keep the animal standing with its hind parts higher than its shoulders. It is sometimes advisable to sew the lips of the vulva together. This may be done with a very coarse darning needle threaded with strong twine or wire. Leave the stitches in for four or five days. The stitches should be deep so they will not easily pull out. This may seem like cruelty to the animal, but it is the surest way to keep the uterus where it belongs. In the meantime give the cow laxative feeds and keep the bowels moving freely.

MILK-FEVER

Milk-fever is also called parturient paresis or paralysis. Strictly speaking it is not a fever at all. It occurs more often in heavy-producing cows. Artificial or unnatural living conditions are largely responsible for this disease because it is never seen in wild animals. Cows that are too generously fed and given very little exercise are most susceptible. In most cases, milk-fever occurs within three or four days after the birth of a calf. It may happen before calving or as late as a month afterward. It seldom takes place with the first or second calf.

The cause of milk-fever is unknown. Many contributing causes are given but the actual reason has not been discovered. High-producing animals and unusually fat cows are more subject to it than thin scrub cows. Many think it is due to the absorption of toxic or poisonous substances related to milk secretion. Constipation and close confinement take their share of the blame.

The first symptom noticed is loss of appetite. The animal appears depressed and may stagger and act weak in the hind parts. The pupils of the eyes are dilated and the eyelids twitch. This is followed by a period of unsteadiness when the cow may go down. After a few futile attempts to rise, it may lie quietly on its side for a while. The head is frequently drawn to one side with the muzzle pointing toward the udder. This is often spoken of as the typical milk-fever attitude. At first there may be some restlessness, but this is soon followed by apparent unconsciousness. The breathing is slow and long drawn out. The pulse is likely to be rapid. The temperature is below normal. The normal temperature of a cow is about 101° or 102° Fahrenheit. The nose, ears, and feet are cold.

Before the present treatment became general, most animals affected with milk-fever died. Today a death from this disease is rare. Various drugs have been advocated and tried, but have not been successful. The air treatment seldom fails to bring about a speedy recovery, even in an animal that appears almost dead. It will not bring the dead to life, however. By air treatment is meant the inflation of the four quarters of the udder with sterilized or filtered air. The best equipment is the regular milk-fever outfit which has been designed for this special purpose. One should be in the hands of every good dairyman. These outfits may be purchased for a small sum from any mail-order house that sells stockmen's supplies. Otherwise a veterinarian should be called. Home-made outfits have been made but are seldom satisfactory. The regular equipment consists of a rubber bulb for pumping the air through a small metal tube containing sterilized cotton (Fig. 4). From here it passes on through another piece of rubber tubing. At the end of this piece is an ordinary milk-tube. Be sure to boil the metal milk-tube before it is inserted into the teats.

Treatment consists in blowing up each quarter with the filtered air. First, wash the udder and teats with soap and water. The animal will be lying on its side so raise the

udder and slip a clean towel under it. Insert the sterilized milking tube into the teat and pump in all the quarter will hold. Withdraw the tube and tie the teat tightly with a piece of cloth or bandage tape to prevent the air from escaping. Repeat the operation on each teat. Usually only one inflation of the udder is necessary, but in rare cases it may need to be blown up again if the animal does not respond in two or three hours. As a rule, the cow is on its feet in an hour or two and peacefully chewing her cud. The immediate response is marvelous. In a very short time it would be difficult to tell that she had been sick. The tapes or bandages may be left on the teats until complete recovery takes place. It

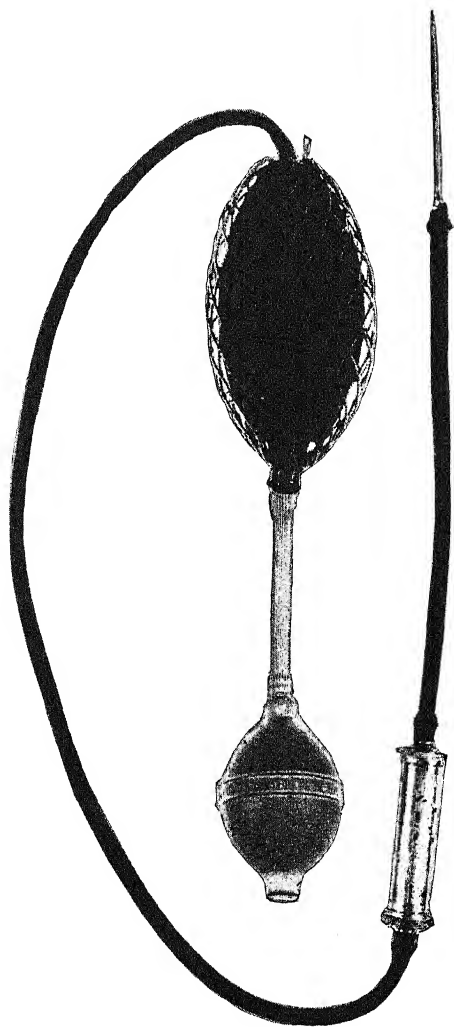


FIG. 4.—Apparatus employed to inflate the udder in milk-fever.

would do no harm if they were allowed to remain for twelve hours. After this they may be taken off and the udder gradually milked out. Some dairymen do not attempt treatment of animals because they appear almost dead. It is always best to try the treatment, for some of these hopeless cases recover.

Milk-fever can be prevented by careful attention to the diet of the cows before calving. Put them on a starvation diet for a few days if necessary. A plentiful supply of salt should be accessible to the cows. This alone will stimulate the consumption of large quantities of water. During cold winter weather the water should be warmed to encourage drinking. No cow likes cold water. Give the animal a dose of Epsom salts about twenty-four hours before she is due to calf, 1 to 1½ pounds. If possible allow plenty of exercise before calving.

BARRENNESS OR STERILITY

Some herds now and then have an animal that fails to conceive or settle with calf. Such an individual is called a non-breeder. Relief is sought by means of panaceas that are harmless as well as useless. There is no mystery about a barren animal. The barrenness almost always follows some functional disorder of the generative organs. This trouble must be corrected before the cow will again conceive. Pills, potions, and powders do no good. The advertising pages of many agricultural papers frequently contain sure cures for sterility without taking the cause into consideration. The intelligent breeder will seek to find the cause and, if possible, undertake common-sense treatment if such exists. Stimulants of the usual sort are worse than nothing at all.

In some instances a cow may become sterile from an infection of the womb following abortion disease. This is considered one of the symptoms of contagious abortion. A persistent discharge will render the animal unfit for further breeding. With proper treatment the animal might be

put in breeding condition. If this is not done, the chances are that she will become permanently sterile.

Other animals become temporarily sterile for some physiological reason, as retained yellow bodies and cysts in the ovaries. The cow may fail to come in heat altogether, or the heat periods may appear at odd intervals. Some cows come in heat two or three months after the owner thinks they are safely with calf. This would indicate that the cow aborted in the early months of pregnancy and the aborted fetus or calf was too small to be noticed. The cow is then thought not to have been with calf at all.

In rare cases the bull may be to blame for an epidemic of sterility in a herd. The cows are normal, but the bull is unable to settle them with calf. Certain diseases of the reproductive organs may disturb his ability as a breeder.

HOW TO CARE FOR THE BULL

A good bull is worth care. It is folly to invest in a pure-bred sire and then let him shift for himself. On such farms a scrub bull would be more economical. Many bulls are kept in the darkest and dampest part of the barn. This will not improve his disposition. Bulls are sometimes allowed to stand in manure several inches deep. The feet are often left uncared for to such an extent that the bull walks as though he were on runners.

If the bull is raised from a calf, he should be handled much the same as a growing heifer, so far as feed and care are concerned. The early growth is very important; skimping on feed will surely result in a stunted bull. The young bull must be kept growing. He is a future herd sire and should be fed and handled so that he will attain his full development. The feed and care of calves given on page 97 will be satisfactory for the growing bull calf.

Mature bulls in active service should be kept in good flesh, but not fat. There is no great danger of their becoming too fat unless they are heavily grained with corn. Oats or oats, bran and corn with a little oil-meal added to regu-

late the bowels, together with alfalfa or sweet clover, should be satisfactory. Some silage may be fed for its laxative properties. Many breeders feel that large amounts of silage have a tendency to make the bull pot-bellied and sluggish. Ten or 15 pounds of silage daily is sufficient. One must not lose sight of the reason for the bull's presence in the herd. He must be fit, but not fat. He must be in good solid flesh, but not beef fat. An over-fat bull might easily become irregular in his breeding habits.

The herd bull should not be allowed to run on pasture with the herd. This leads to pasture breeding. If this practice is followed, it will be impossible to keep an accurate record of the breeding dates of the cows. Heifers are frequently bred too young. The bull will disturb the peace of the herd and often injure himself. In summer, the bull will require an open shed and paddock to himself. Exercise is essential. During the winter months, he should have a box-stall in the barn. This might open into a small yard for exercise on pleasant days.

Good care and management will often prevent sterility in the bull. If an animal in good physical condition is suspected of being responsible for failure to settle the cows, he should be subjected to a careful physical examination. Sterility in the male is much less frequent than in females, but it occurs often enough to make it a factor to be investigated when sterility exists in a herd. The bull may be permanently sterile as a result of a chronic inflammation on the organs of reproduction. Some of the common pus-producing germs at times become localized in the testicles, causing sterility. The germ of contagious abortion has been known to settle in the testicles. To re-enumerate the causes of sterility in the bull, one might name certain infectious diseases such as contagious abortion and tuberculosis, old age, over-feeding with consequent lack of vigor and too little exercise.

A complete physical examination would mean observation

of the testicles, sheath, and penis. Tumors on the penis or on the inside of the sheath sometimes make breeding impossible or at least uncomfortable. Following this, a sample of semen should be taken and examined under the microscope. This is a laboratory test and cannot be undertaken by the owner. The semen should be examined immediately after it is taken, so that it does not become chilled. The test is to learn whether the spermatazoa or male germ-cells are present in large numbers and whether they are actively moving. Healthy semen would show innumerable rapidly moving male germ-cells. If the microscope reveals inactive or sluggish germ-cells or if they are few in number, it will be time to consider whether it is best to dispose of the animal. If the bull is in very poor physical condition, it is possible that after his health is improved he may again become a satisfactory breeder. Good care and feed are of paramount importance. If the examination shows tumors on the penis or sheath, they must be removed by a surgical operation.

BARRENNESS CAUSED BY AN INFLAMED OR DISCHARGING WOMB

This type of sterility may occur as a complication of contagious abortion or independently of that disease. It is useless to breed an animal with a discharge from the uterus. Not only will she fail to settle with calf, but will expose the bull to infection. It is difficult to estimate just how long it will take to put such an animal in breeding condition. It may require a few weeks or it may take several months before she is again normal. Animals that fail to respond to treatment should be sold for slaughter.

Discharges are caused by some infection retained in the uterus. This must be stopped by simple irrigation of the uterus. If the owner desires to attempt treatment himself, it will be along the same lines as recommended for the handling of a cow after an infected afterbirth has been

removed. Secure an 8-foot length of $\frac{1}{2}$ -inch rubber tubing and a funnel. A regular soft rubber horse-catheter is better than ordinary rubber tubing. In the absence of either, a common household douche bag may be used. The salt solution is the best for irrigation purposes. This is made by adding 2 tablespoonsful of common salt to a gallon of lukewarm water. Strong disinfectants are to be avoided. Most are caustic in action and do great damage. Put the cow in a stall and fill the bag with the salt solution. Hang the bag high enough to drain easily. If the owner is not skilled in such work it will be best to wash out the vagina only. Harm will be done if the opening into the uterus is practically closed and an attempt made to open it forcibly. The neck of the womb sometimes closes to a very small diameter. Some attempt to open it with a broom handle. If easy entrance into the womb is impossible, leave the operation to one skilled in this work. If the neck of the womb is open and easy entrance is possible, the womb may be irrigated if the operator is careful not to injure the walls of the uterus. After irrigating the womb, be sure to siphon out the fluid, by allowing the outside portion of the rubber tubing to hang down. This is necessary because the cow may not throw it out herself. A simple washing of the vagina will often bring beneficial results without the uterine douching. The irrigations may be repeated daily for a week and then twice a week until the discharge is entirely stopped.

In this operation, as in the one for the removal of an infected afterbirth, the operator should be careful to wash his hands and arms. Grease the arms with vaseline and, when the work is completed, wash the arms thoroughly. If the treatment does not bring beneficial results after a reasonable time, the animal should be disposed of. The treatment of a discharging sterile animal is a delicate one and if the owner values her highly it will be best to secure expert assistance. Of course the animal should not be re-bred until all discharges have ceased.

BARRENNESS CAUSED BY FUNCTIONAL DISTURBANCES
OF THE OVARIES

Numerous cows fail to breed regularly because they do not come in heat. This is sometimes due to the retention of what is commonly called the corpus luteum. During the heat period, an egg or ovum is discharged from an ovary. This is conveyed through the tube into the womb. If the egg becomes fertilized by the male cell or spermatazoa, pregnancy results. The hole left in the ovary after the egg leaves it is filled with a yellow pigmented material called the corpus luteum. This corpus luteum or yellow body remains in the ovary during the time the cow carries the calf. After the animal calves the yellow body usually becomes absorbed. If the egg which ruptured from the ovary is not fertilized in the uterus, the corpus luteum disappears. If for any reason the normal functions of the ovaries are disturbed, the yellow body does not become absorbed after the cow calves. At times the yellow body persists in the ovary even though the egg was not fertilized. These yellow bodies frequently are as big as a hickory-nut. The failure of the yellow bodies to disappear naturally is called retained corpora lutea or yellow bodies. This leads to the failure of the animal to come in heat, leading the owner to believe that the cow is either pregnant or permanently sterile. The removal of the yellow body will usually cause the animal to come in heat in three or four days.

Sometimes the retained corpora lutea become cystic. This is the formation of a blister-like swelling in the ovary. The cyst is filled with a fluid. This results in an animal being continuously in heat or she might show irregular heat periods. This condition is usually termed cystic ovaries and the affected animals are called "bullers."

Treatment for the removal of yellow bodies or cysts should not be attempted by the owner. It is a difficult procedure and calls for much skill. The retained yellow body must be squeezed out or the cyst broken down. When this is done, the animal almost always resumes its normal heat

periods. The removal of a retained yellow body will sometimes bring an animal in heat as early as the next day. The rupture of the cysts results in a normal heat period for the "buller." The operator introduces his hand and arm far into the rectum and by careful manipulation of the ovaries succeeds in pressing out the yellow body or cyst. A knife is not used. This is a type of bloodless surgery.

WHEN TO DISPOSE OF A NON-BREEDER

If the affected animal is old or not specially valuable, it will probably be best to sell her for slaughter. Many cows are bred every time they come in heat. If a cow fails to settle after one or two trials, she should be rested for two heat periods and tried again. If this fails, treatment should be undertaken or the animal disposed of. Too frequent service often aggravates the trouble and may injure the bull. If an animal is of moderate value, it is good practice to have her examined by a skilled veterinarian. The simple removal of a yellow body may end the trouble. If the examination reveals the cow to be permanently sterile, treatment may be omitted and the cow sold. An infected animal should be carefully attended and the discharge stopped as early as possible. A few weeks after the discharge has ceased and the heat periods are resumed, the cow may be bred. If she fails to settle, dispose of her. Quack remedies are worthless.

THE RELATION OF DIET TO REPRODUCTION

Considerable work has been undertaken relative to the importance of diet on the breeding efficiency of cattle. The presence or absence of vitamins come in for their share of investigation. At the present time nothing of a definite nature has been discovered concerning the effect of various feeds and vitamins on the breeding ability of an animal.

Many statements are made as to the effects of mineral feeding on sterility and abortion. Animals in a very run-down condition, either from a diet lacking in minerals or other essential parts of the diet, may fail to breed satis-

factorily. In some sections where the soil is deficient in certain minerals, depraved appetites are common. The animals eat sticks and bones and eventually go completely out of condition. Under such circumstances there is no doubt that the breeding activities of the herd would be seriously affected. The deficiency is largely one of phosphorus. This can be supplied by the addition of bone-meal or spent bone-black to the grain ration, put in a self-feeder and the animals allowed free access to it at all times. A herd of cattle fed a well-balanced grain ration and having the benefits of alfalfa or sweet clover is not likely to suffer with this disease.

The owner of a herd of cattle should not expect mineral feeding to cure an animal affected with a chronic discharge from the uterus. Retained corpora lutea or cystic ovaries will not be removed or prevented by mineral feeding. For a more complete discussion of mineral feeding, the reader should consult the next chapter.

CHAPTER VI

OTHER COMMON AILMENTS OF CATTLE

IN this chapter are grouped those diseases that do not fall naturally into the classes already discussed. This position is not to be taken as an index of their relative importance. Most of the diseases are common on farms.

MINERAL DEFICIENCY IN CATTLE

The subject of mineral feeding is of prime importance to all farmers. Much misinformation has been spread about the use of minerals. In some instances such extravagant claims have been made that a good farm practice has fallen into disrepute. Since mineral feeding became commercialized, it has been hailed as a cure-all for almost every disease of man or animals. Farmers are beset on all sides with conflicting statements as to the efficiency of this or that mineral mixture. Certainly many animals are fed rations deficient in some of the essential minerals, but it is carrying the argument a little too far to assume that a mineral-deficient ration is responsible for such widespread diseases as contagious abortion and tuberculosis. Some of the mixtures offered are little more than the old-fashioned stock tonic with a new label. Some of these very complex mixtures actually do harm. Many contain ten or more elements when one would serve the purpose, and they only increase the cost of the mixture. Most cattle owners have long recognized that live-stock do not need tonics for normal growth. Good feeding will insure this. Mineral feeding will not double the milk-flow, it will not increase the number of pigs in a litter, nor will it make a hen lay

more eggs. While cows suffering from deficient mineral supply may give a reduced quantity of milk, it does not follow that all herds will be greatly benefited by a mineral mixture.

Minerals will not cure or prevent any known contagious disease of animals. Under normal conditions, in sections where the soil is not markedly deficient in its natural proportions of minerals, a herd that is fed a well-balanced grain ration together with plenty of alfalfa or sweet clover is not likely to be in great need of any mineral mixture. Before making any recommendations as to the sensible use of minerals, it will be best to study the subject of mineral feeding and then try to outline a rational routine to follow. Only cattle will be considered in this chapter. Their mineral requirements are different from other live-stock and, therefore, will be discussed separately.

Mineral deficiency in cattle is not a new subject. It has been popularized and commercialized to such an extent that many farmers think of it as a new disease affecting cattle only during the present generation of man. Mineral deficiencies have been reported in various classes of live-stock for the last fifty years in all parts of the world. In some instances the disease described was not known to have been caused by deficient mineral supply. Recent investigations have led many scientists to believe that this was the case. The trouble is widely distributed in some countries while in others it affects only certain areas. It exists in those regions where the soil itself is deficient in its normal quota of the basic minerals, especially phosphorus.

Mineral deficiency in cattle has been given many different names. A recital of all of them is unnecessary. The common veterinary term is pica or depraved appetite. Such colloquial terms as stiffs, cripples, bighead, and rickets are commonly applied.

Cause

The cause of pica or depraved appetite of cattle is gen-

erally conceded to be due to a shortage of phosphorus in the rations. This shortage applies chiefly to the roughages grown on soil deficient in this mineral. Calcium or lime was formerly credited with being the sole cause of this trouble. Most roughages, such as the clovers and alfalfa, contain sufficient calcium, although it may be lacking sometimes when these roughages are grown on sandy or peat soil. Even with a shortage of phosphorus in the roughages, the trouble probably would not appear if a full and balanced grain ration was fed. It is possible that in some sections a shortage of both phosphorus and calcium might bring about depraved appetite. When calcium deficiency is encountered it usually is caused by a skimpy grain ration, together with large quantities of timothy or other grass hay. Calcium deficiency is rare when any of the legume hays are fed. In the affected areas winter feeding of large amounts of dry forage crops tends to aggravate pica. The period when depraved appetite is at its worst is from February to May. On some farms the affected herds receive nothing but wild hay, straw, and corn stover. Very little grain is fed. Cattle grown in areas where mineral deficiency is common are usually under-sized and the head may appear too big for the body.

Symptoms

The first symptom the owner notices is the desire of some of the cows to chew bones and wood (Fig. 5). In the first stages of the disease the cows seem to prefer bones. Later their taste changes to wood. Mangers are often gnawed to such an extent that they have to be rebuilt in the spring. Soft wood fence-posts are attractive to these animals. Others chew sticks, stones, bits of metal, leather, and even eat dirt. The first symptoms are likely to appear during the winter months after a long winter feeding of little or no grain ration and roughages naturally deficient in phosphorus. If the soil does not contain enough phosphates the plants grown on it cannot have the required amounts. There

is loss of appetite and weight. The milk-flow is reduced. This is to be expected because many of the cows spend most of their time in search of bones and sticks to chew. In some cases it resembles a mania. One farmer reports that several animals actually devoured a fur coat that was accidentally left within reach. Another tells of a herd that traveled a mile across the farm each day to feed on a pile of bones. After a long period of chewing foreign bodies such as bones and sticks, the animal may become stiff in the



FIG. 5.—Animal suffering from mineral deficiency as evidenced by the bone-chewing habit.

joints. This may cause lameness and the animal moves as though in pain. This is one of the last symptoms.

Cows in milk suffer most. Growing calves and heifers come next. Cows affected while in milk often recover in the dry period. When mature cows are brought to a farm in an area affected with this disease, they do not show evidence of depraved appetite for about a year. The general run-down condition of the females in the herd seriously interferes with their ability to breed.

A herd which shows evidence of mineral deficiency may also be low in breeding efficiency. This does not mean that the numbers of abortions in such a herd are increased, but rather a reduction in the annual calf crop, due to the failure

of many cows to become pregnant. Eckles, of Minnesota, concludes that the shortage of calves is probably due to lack of ovulation on the part of the females. In other words, eggs or ova are not discharged from the ovaries at regular intervals as would occur if health were normal. In explanation of this phase of mineral deficiency on normal reproduction, Eckles and others state, "All severe cases that came under observation were cows either in milk or at the end of a milking period or were growing animals. It is the general belief of farmers in the affected regions that the heavy producing cows suffer most severely. It is well known that milk production is a heavy drain upon the mineral supply of the body. The experience of keeping cows on typical mineral deficient rations at the experiment station has been that dry cows, even from the affected areas and presumably having a low storage of minerals, do not show symptoms. Cows in milk on the same rations show the symptoms readily in a few weeks. When the cow receiving a ration very low in phosphorus must supply this element for the milk, the body is undoubtedly called upon to make up the shortage, leaving the animal in a depleted condition. As a result of this depletion of minerals, ovulation or heat is suspended during the milking period. After milk production ceases the animal usually is able to replace slowly the mineral reserve and when a certain point is reached, usually about a year from the time of freshening, heat appears. As a result of this condition, a cow is inclined to have a calf every other year, which is in line with the observation made by some farmers."

It should be kept in mind that the above statement refers only to those sections of the country where marked mineral deficiency exists in the soil and the crops grown on it. This would also apply to herds with depraved appetites. When no depraved appetites are observed and normal balanced rations are fed, this condition would not exist. The calf crop in a mineral-deficient herd where depraved appetites are common is often reduced as much as 50 per cent. This is

not the result of abortions but rather that the cows fail to come in heat after calving, and consequently do not settle with calf. It is not until the cow has been dried off that the mineral balance is again restored, thus enabling her to resume normal heat periods. Present information does not indicate that mineral deficiency has any bearing on the prevalence of abortion in a herd. Most of the herds showing sterility of this type would not be classed as well-cared-for. Further study of mineral deficiencies may show that other factors besides a phosphorus deficiency have a bearing on this trouble. The fact remains that the addition of phosphates to an otherwise balanced ration readily corrects this evil.

The mineral deficiency situation in cattle should not trouble the well-informed stockman. If the herd in question is fed a well-balanced grain ration, together with plenty of alfalfa or the clovers, the chances are that they do not need any additional supply of minerals. This would be especially true when no depraved appetites are observed. If there has been trouble of this sort in the neighborhood, a little investigation will bring this to light. A complex mixture is not desirable even though depraved appetites exist.

Cure or prevention of depraved appetites

When this disease appears in a herd, steps should be taken to supply phosphorus to make up for the shortage in the feeds naturally grown on the farm. The best way to do this is to provide the cattle with bone-meal. This is not ordinary ground bones from a butcher shop. Commercial bone-meal is made by the large packing companies from clean bones, carefully ground and sterilized. Bone-meal may be fed the same way as common salt; put it in a box or self-feeder and permit the animals to have free access to it at all times. About 50 pounds will fill the needs of a mature cow for a year. One should purchase a good grade of bone-meal. The fertilizer grades are not desirable because they have an unpleasant odor and the cows do not eat them

readily. The bone-meal may be mixed with salt or it may be fed alone. It is probable that when the use of phosphate fertilizers becomes general, mineral deficiencies of this nature will disappear because the forage crops on soil well fertilized will contain sufficient phosphorus to supply the needs of the cows.

SWEET-CLOVER POISONING

Sweet-clover poisoning should not be grouped under poisonous plants, for it would give the impression that sweet clover is always dangerous forage for cattle. It is, under certain conditions. The publicity given to some cases of sweet-clover poisoning has led farmers to plow or abandon fields used for this crop. This is unfair to an excellent forage crop. The discussion of poisoning following the use of sweet clover will be of interest to any farmer who has experienced this trouble in his herd and also to anyone who is contemplating planting sweet clover.

Poisoning following the use of sweet clover refers to the hay only. No cases of poisoning have been reported when the cows are on the fresh green pasture. Cattle are poisoned because the hay is not properly cured. All moldy sweet-clover hay is not dangerous to feed, but certain species of molds may cause the hay to become poisonous. It is difficult to tell when the moldy hay is harmful to feed. Much of the moldy hay and silage does not hurt cattle at all. Ordinary observation is not sufficient to ascertain whether the moldy hay is poisonous. The extent of the mold is no indication of the unfitness of the hay for feed. Some samples of poisonous hay do not look as bad as other moldy samples that are harmless. All moldy sweet-clover hay should be regarded with suspicion. As far as is known, molds of this sort have no effect on other hay crops.

Sweet-clover poisoning is considered a new disease. It is not contagious. Reports of this disease have been made in several of the northwest states, but it may occur in other states when sweet clover comes into general use as an impor-

tant hay crop. Cattle are the principal sufferers. Horses do not seem to be affected by eating moldy sweet-clover hay that has killed cattle. Sheep also are thought not to be injured seriously by spoiled sweet-clover hay. Cows under three years of age are most likely to become sick from this disease. Its occurrence in older animals is rare. Cattle begin to show symptoms in three to six weeks after they are given the spoiled hay.

Symptoms of sweet-clover poisoning

The first symptom noticed is stiffness in one or more limbs. The animal moves with some difficulty. The next change is the appearance of swellings anywhere on the body. These may be very small or they may be as big as a doubled fist. The lameness and swellings might cause this disease to be confused with blackleg. It should be remembered that the blackleg swelling is merely an air pocket and crackles as the hand is passed over it. The swellings in sweet-clover poisoning are doughy and filled with blood. They might be termed blood-blisters.

The cause of death in sweet-clover poisoning is that the animal actually bleeds to death under the skin and in and between the layers of muscles. The hemorrhages are found all through the body. Bleeding from the nose is sometimes described. The nature of the disease is such that the blood becomes very thin and watery. Sometimes the number of the red corpuscles usually present in the blood is reduced as much as 50 per cent. With this thinning of the blood, it also loses its power to clot. A cow with any sort of a wound at this time easily bleeds to death. The affected cows do not have any rise in temperature. It is often below normal. The appetite usually remains good. The pulse speeds up to such an extent that the beat of the heart can sometimes be heard several feet from the sick animal.

If the carcass of a dead animal is opened, extensive hemorrhages or bleeding places may be found in many areas under the skin and in the muscles. Sometimes collections of blood

several pounds in weight are present under the skin or between the layers of muscles. Many hemorrhages are seen on the heart. These may be as big as the head of a pin or as a finger-nail. The lungs, liver, spleen, and kidneys do not usually show noticeable changes.

When to suspect sweet-clover poisoning

If the herd is fed on sweet-clover hay at the time the sickness appears, this disease should be suspected. Lameness and swellings might confuse the owner, leading him to believe that blackleg was responsible. It would be well to call a veterinarian at this time to make sure of this point because a grave mistake would be made if the herd was not actually suffering from sweet-clover poisoning. Farmers who are familiar with blackleg from long experience should have no difficulty in distinguishing it from sweet-clover poisoning. The chief difference between blackleg and sweet-clover poisoning in the live sick animal is in the character of the swellings. The blackleg swelling crackles under pressure of the hand while the other does not. The sweet-clover swelling is doughy, filled with an accumulation of blood, and does not contain gas. A laboratory examination of the blackleg carcass would definitely identify that disease.

Examination of the sweet-clover hay would usually show molds. The ordinary observer would not be able to tell the injurious moldy hay from the harmless. If the hay is moldy, and unfortunately much of it is because sweet clover is difficult to cure on account of its large juicy stalk, it should be considered unfit for further use until it has been proved harmless. An animal sometimes is not visibly sick, but may bleed to death if castrated or dehorned at this particular time. When the early symptoms are first noticed, the hay should be removed and the animals supplied with some other safe hay. Samples of the hay may be sent to an agricultural college for testing.

Treatment

First of all, the sweet-clover hay should be removed and clean fresh hay of some other variety supplied. If the animals have been on a diet of hay alone, add some grain to the ration. It should be remembered that the sick animals are bleeding internally and it is conjecture as to how many will recover with or without treatment. Treatment of the sick animals consists of blood transfusions. Something must be done to increase the clotting power of the blood and to prevent it from oozing through the walls of the blood-vessels. Additional blood-corpuscles must be supplied to replace those that have disappeared. The quickest and most effective way to do this is to inject blood from a healthy cow into the sick one. A veterinarian must perform this operation. The blood is drawn from the jugular vein of the healthy cow. It is then treated to remove the clotting portion of the blood, after which it is injected into the jugular vein of the sick animal. If the cow is not too far advanced in the disease, recovery takes place as if by magic. Drugs and other biological products are of no value in the prevention or treatment of sweet-clover poisoning. Animals in the first stages of the disease will usually pick up after the poisonous hay is taken away.

One should not forget that all moldy sweet-clover hay is not poisonous. The probabilities are that most of it is not. Considerable moldy hay is fed every season and comparatively few cases of poisoning follow. If the owner of a stack of sweet-clover hay wishes to take precautions against this disease, he should examine it carefully and look for molds. If it is moldy, it is comparatively easy to test it to determine whether it is safe to feed.

If trouble has already appeared, the test will serve to make sure that the sickness was caused by the moldy hay. Tame rabbits are used for the test because they are much more susceptible to sweet-clover poisoning than cattle and usually fall sick in about ten days after they are put on the moldy hay diet. The rabbits should be fed a handful

of whole oats along with the hay. Rabbits show about the same symptoms as cattle, bleed internally and die in six to twenty days.

Should the farmer have a stack of moldy hay that he wants to test before he begins to feed it, the rabbits will provide reasonably safe insurance. He could start the rabbits and cattle at the same time, as the rabbits will become sick and die before the cows begin to show symptoms. This will give the owner time to take the cows off the sweet-clover hay and substitute another and safer feed. No harm will usually come to the cattle and they will recover fully from their brief exposure to the moldy sweet-clover hay.

If the moldy hay kills the rabbits in about a week, this would mean that it is especially poisonous. It probably will be best to discard the hay entirely. If it should take two or three weeks to make the rabbits sick, this hay may sometimes be fed to horses, sheep and some of the older cows without danger, if other feeds are alternated with it.

On many farms where sweet-clover poisoning occurs it has been the custom to use the hay as the principal or even sole article of diet. Perhaps if the cows were not obliged to depend on the sweet-clover hay alone, poisoning would not have happened. Some cattlemen feed the moldy hay in alternate weeks, one week good hay and the next week moldy hay. This is often successful.

The safest practice, of course, is not to use the poisonous hay at all. The following facts should be kept in mind when considering sweet-clover poisoning. Hay is meant and not the green pasture. Most sweet-clover hay is not cured properly. Much of it is moldy. Tons of this moldy hay is fed annually without trouble. The difficulty is that one is not able to tell by looking at the moldy hay which is dangerous and which can be fed safely. Some moldy hay is evidently poisonous and some is not. Use the rabbit test to find out in case of doubt. Do not castrate, dehorn or perform any surgical operation on cattle while they are on

questionable sweet-clover hay. Take the hay away from them at least two weeks before the operation. The animals may not appear sick, but the blood may have lost just enough of its power to clot or coagulate so that fatal bleeding may follow. Some authorities maintain that the danger of excessive bleeding applies to animals on sweet-clover pasture also. To be safe it would be well to keep animals off pasture for some time before any operation.

MOLDY SILAGE

Most up-to-date dairy farms use a silo. These silos are usually filled with corn silage in the autumn. Much of this silage develops molds during the winter and spring months. In the season when ensilage is fed, one is likely to hear many reports of cattle dying as a result of eating moldy silage. It should be understood at the outset that moldy silage is not uncommon, in fact most silos have more or less molds. Tons of silage, moldy in various degrees, are fed without any ill effects. If the cattle become sick during the time moldy silage is being fed, it is most natural and easy to blame the silage. This is done many times each season. The silage may be to blame but that does not prove that the molds are the cause of the deaths.

Several reports have been made of cattle and horses dying when fed silage that happened to be moldy. In none of these cases has it been demonstrated conclusively that the molds in the silage were the cause of the deaths. There may have been something else present that was detrimental. In some instances in which horses have died, the same silage has been fed to cattle without any bad effects. It is possible that the method of feeding was faulty. Much silage is put up improperly and extensive development of molds is likely to occur during the feeding period.

Ensilage often contains many different species of molds. When the mold is very heavy, it is usually difficult to isolate or separate the various species. Eckles, Fitch and Seal, of Minnesota, secured samples of spoiled silage from many

different farms and isolated twelve different kinds of molds. These were representative types usually encountered in moldy silage. These twelve molds were isolated from the different samples and grown artificially on specially prepared media. Large quantities of the molds were fed to cattle, horses, and sheep without harm.

Moldy silage, and especially that which is badly spoiled, may make the casual observer dubious as to its fitness for food. To offset this impression, experiments have been made with silage from the farms where several deaths were reported to have followed its use. As much as a ton of the moldy silage from such a farm was fed to several cows for many days without any signs of sickness.

There have been several reports of deaths in cattle and horses following the use of moldy silage, but it has not been definitely proved that the molds in the silage were responsible for the losses. The practical experience of many farmers who feed silage that contains molds to varying degrees is that no ill effects are seen. In cattle, moldy silage has not been conclusively proved to be dangerous. In horses there remains some doubt. Most silos contain silage that has in it some molds. To condemn silage on this account would put many silos out of commission. Improved methods of making silage may reduce the amount of molds. If the silage is badly infected with molds, it might be better to conduct a feeding trial on one or two animals before the entire herd is allowed access to it. If the silage does not contain any great quantity of molds there need be no hesitancy in feeding it to cattle. If an obscure disease of the cattle develops during the feeding period, it would be well not to jump at conclusions and convict the moldy silage. It is likely that something other than the molds in the silage is at the bottom of the trouble.

FOOT-ROT

Foot-rot is sometimes called foul-in-the-foot. It is a non-contagious disease of cattle, but may affect other farm

animals. Foot-rot begins as an infection between the toes and may affect all four feet. This disease is observed most commonly in the spring, summer and fall. It is seen more often in long periods of wet weather when the cows stand in mud or water much of the time. When several cows are affected with foot-rot at the same time, the owner may think it is a contagious disease. The presence of foot-rot usually means that the herd is not kept in very sanitary surroundings. A bull that is obliged to stand for weeks in a dark box-stall where the manure is permitted to accumulate might easily develop this trouble. The yard adjacent to the dairy barn might be in a very low place, where the water does not readily drain away. This would favor the occurrence of foot-rot. Mud and manure collects between the toes and sets up an inflammation which in turn may lead to breaks in the skin through which pus-producing germs enter. The infection then spreads and filters under the horny wall of the hoof. The tissues under the hoof of cows are abundantly supplied with blood-vessels and are very sensitive. It should be kept in mind always that the disease does not spread from one cow to another, but rather that each cow, being exposed to the same conditions, develops the infection from the same source. Foot-rot is said to be most common in the hind feet, but it may affect the front feet as well.

Symptoms

The affected animal becomes very lame. The ankle may be very much swollen and feel warm to the touch. The odor of a foot affected with rot is often very foul. On examination the tissue between the toes is likely to be decayed or rotten. If this is allowed to go untreated, the infection will spread and undermine the entire hoof. Cases have been reported in which the entire horny covering of the toe has sloughed off. A cow that is badly affected in one or more feet often goes off feed because it is painful to move.

Treatment

The first step is to remove the affected animals to dry and clean quarters. This would apply to the balance of the herd also, to prevent other animals from becoming infected. In treating an infected foot, clean the skin between the toes. Wash the foot thoroughly with hot water and soap and scrape away all the loose diseased tissue. If the infection has reached the under side of the wall of the hoof or has broken out above the hoof wall, it will be best to call a veterinarian to operate on the foot. If taken early, simple home treatment often brings about a cure. Clean the foot as directed. In some instances it may be necessary to throw the animal in order to do the work properly. After the dead infected tissue is removed, the affected part may be bathed with an antiseptic solution. Pure creolin may be used if it is applied with a cotton swab and care taken not to touch the healthy parts of the hoof. Tie a piece of cotton to the end of a small stick and dip it into the creolin. Apply this carefully to the diseased part of the toes. If the pus has burrowed deeply into the hoof, hydrogen peroxide should be poured into the wound. This will boil out the dirt and pus. The important part of the treatment is the careful scraping away of all the diseased tissue. Sometimes portions of the horny wall of the hoof must be cut away to reach the bottom of an abscess. All the dead tissue must be removed before complete healing will take place.

The usual routine treatment is to begin early, remove the animal to a clean place, scrape away the abscessed tissue, apply the undiluted creolin or other good dip, and smear some pine tar over the affected part. It is often good practice to pack some oakum over the pine tar and cover the foot with a bandage made from a bran sack. Stable the animal in a clean dry place until complete recovery takes place.

If the season is wet and the animals stand in damp places, examine the feet at intervals so that the trouble may be

detected early. If an animal becomes lame under these circumstances, it is possible that the foot is infected.

DEHORNING CATTLE

The practice of dehorning cattle is universal. Many reasons are given why cattle should be dehorned. They are easier to handle. They are not likely to injure one another. They are not so dangerous to the owner or caretaker. Some think that the animal presents a better appearance, and at least they are more uniform.

Dehorning may be performed in three ways. The horns may be prevented from developing when the calf is only a few days old. Many farmers prefer this method because it is far easier and more humane. If the horns are not removed until they are fully developed, they must be cut off by sawing or clipping. Rare instances have been reported when men have thrown an animal and chopped the horns off with an ax. Anyone doing this is guilty of the grossest brutality.

Dehorning with caustic stick

This is the simplest, easiest, most humane, and best way to dehorn an animal. It might not apply to range conditions, but it does on the average dairy or stock farm. The objection to this method is that it takes too much time, but it leaves a much better developed head and prevents fly-time dehorning troubles.

All that is needed to perform this operation is a stick of caustic soda or caustic potash. These come in pencil form and can usually be secured from any drug-store. Besides, one will require a pair of scissors, a small jar of vaseline, and a tumbler of water. The calf to be dehorned should be from four to ten days old. This, of course, may vary somewhat. At this age the horn button or germ is loosely attached to the skull.

Feel around where the horn ought to be, until the horn button is located. Clip the hair over and around the but-

ton, covering an area three or four inches in diameter. Make a ring of the vaseline around the button about an inch all around. This is done to prevent the caustic from spreading to the surrounding skin or running into the eyes. After the skin is prepared, dip the stick of caustic into the water to moisten it. Be sure to keep the end of the caustic stick well wrapped with paper to prevent burning the fingers. With the wet caustic stick rub the skin over each button several times, allowing a few minutes to elapse between rubbings. Keep on rubbing until the skin reddens and the caustic appears to be eating down into the skin. The idea of this treatment is to injure the button so that it will not develop further. Some farmers try this method of horn removal and fail to secure good results. This is probably because the operation is done too hurriedly. While the caustic is eating into the skin, minute pits will be seen. If the weather is rainy, keep the calves inside because the rain may cause some of the caustic left on the head to drain into the eyes. If the caustic is used properly, a scab will form over the button and drop off a few days later. A good burning job is imperative if the button is to be destroyed.

Dehorning with clippers

The clippers is the quickest way to take the horns off a cow. They do the work quickly and are less painful than sawing, but they have the disadvantage of frequently crushing the horn if the cow is very old and the horns brittle. Bleeding is usually more severe when the clippers are used. Clippers are best for young cows because the horn is not so likely to shatter and they can better stand the loss of blood. The clippers may be secured from any of the firms that supply stockmen's needs. They are made especially for this purpose.

Some means of restraint for the animals will have to be devised if many are to be dehorned in this way. An out-

door stanchion could be arranged. If only one or two are to be dehorned, this will not be necessary because the animals may be tied to some convenient post. When the clipper is slipped over the horn, care should be exercised to make sure that enough of the horn is removed. The clippers should be pressed close enough to the head so that the part of the horn which is cut off has a fringe of hair and skin about a half-inch wide. If the horn is not removed close enough to the head, it will grow out again and leave an unsightly head. In some cases the operation has to be repeated at a later date. The amateur frequently makes this mistake. Keep this in mind and press the clippers close to the head to insure that all the horn-forming cells are removed. Fast work is usually necessary and both horns should be removed before the animal becomes restless. One or two unsuccessful attempts at removal will only serve to excite the animal and make the operation much more difficult. For one not experienced it would be helpful to secure the aid of some one who has done this operation before. After one or two trials fair proficiency should be attained.

Dehorning with the saw

This method is not widely used, except for old animals where it is feared that clipping will shatter the horns because of their brittleness. An ordinary meat saw may be employed but a similar saw with a one-inch cutting blade is preferred. Cows are occasionally dehorned with an ordinary wood saw. The meat saw does the work much better. This operation is not nearly so fast as the clippers and better restraint must be provided because the sawing takes some time. If many animals are to be dehorned in this way, a special chute or crate will be needed. Some method must be evolved to hold the head firmly while the horn is sawed off. If only one or two are to be dehorned, they may be thrown or the head may be firmly tied to a tree or to an

overhead stanchion. The same precaution about sawing close to the head must be observed, so that the cut-off portion of the horn has a fringe of hair and skin attached to it. The operation should be done as rapidly as possible. Provide plenty of assistance to restrain the animals.

Care of the dehorned animals

If possible, cattle should not be dehorned in fly time. The wounds may become infested with screw-worm maggots. If flies are in season at the time, special care will have to be taken to prevent their laying eggs in the open wounds in the head. Do not attempt to bandage the head. This takes time and is not worth the effort. The bandage probably will not stay on long anyway. To prevent the attacks of flies it will be necessary to apply some fly repellent to the wound after the horn is cut off. Pine tar is good for this purpose. A small can may be bought at any drug-store. Smear it thickly over the wound and press some loose cotton over this. This will help to prevent any undue hemorrhage.

If maggots should get into the horn wounds, troublesome times are ahead. Once they get down into the cavities of the head, they are difficult to remove. The usual treatment for a maggot-infested horn wound is applied by saturating a piece of ordinary absorbent cotton with chloroform and inserting this into the cavity left by the horn removal. Sometimes gasoline is poured into the wound. Both the chloroform and gasoline will kill the maggots, after which they must be flushed out with salt solution or picked out with a pair of forceps. A weak solution of carbolic acid can also be used to destroy the screw-worm maggots. Make up a solution by adding 3 tablespoonsfuls of carbolic acid to a quart of water. Apply it in the same way as the gasoline or chloroform. When all the worms have been removed from the wound, apply the pine tar. At best, treatment for a maggot-infested wound is not entirely successful. It takes much patience.

CASTRATION

Contrary to the general impression, castration may apply to either male or female animals. The operation consists in the removal of the testicles in the bull and the ovaries in the cow. Most farmers, however, use the term castration when speaking of males and spaying when referring to the operation on a cow. The principal reason for the castration of bulls and bull calves is to make steers of them and thus improve the quality of the flesh from the beef standpoint. The castration or spaying of cows is seldom practiced in this country.

Time to castrate

Bull calves should be castrated when they are young. A calf may be castrated safely when it is from one week to six months old. The calf should be old enough so the testicles are well developed and easy to secure. Most calves are castrated from three to four months of age.

If possible, a cool dry day should be chosen for the operation. Some farmers dehorn and castrate at the same time. This may be done, but if the owner makes it a practice to dehorn his calves by the caustic-stick method before the horns have time to grow, the combined operation will not be necessary. Young calves may be easily thrown and held securely by an assistant while the operation is performed. Larger animals may be thrown by putting on a regular halter with an extra long rope lead, bringing the rope lead backward and making two half-hitches about the body of the animal. The first half-hitch is placed just behind the forelegs, passing around the chest. The other hitch is a continuation of the first one and passes about the body immediately ahead of the rear flank. When the hitches are adjusted, the rope is pulled tightly to bring the head and hind parts closer together. This, together with the squeezing by the half-hitches, will gradually force the animal to the ground. When the cow or calf is down it may be secured by stretching it out and tying the hind feet to

one post and the neck and head to another. It may also be hog-tied by drawing the front and hind feet together and tying them securely. Castration is sometimes done with the animal in a standing position. This applies to older calves and bulls. Careful confinement is necessary to prevent the animal from kicking. This form of operation is best left to the expert.

Necessary preparations

The only instruments needed to castrate are a sharp knife and a pan of any ordinary household disinfectant. Sterilize the knife by boiling before it is used. This is an extra measure for safety from infection. Wash the bag of the bull with soap and water and then wipe it with the disinfectant solution. One often hears stories about castrating in the light of a new moon and many other superstitious beliefs. It is surprising how ideas of this sort take hold in the popular imagination. Some farmers will only castrate on a manure pile. Others regularly pour fresh horse urine into the castration wound after the testicles have been removed. This is thought to prevent infection. Only a short time ago a case was reliably reported where a farmer rubbed fresh cow manure into the wound. This always leads to infection. These practices are relics of the dark ages and should not be countenanced on any well-ordered farm.

Pick out a clean, shady, grassy spot and proceed with the operation. Many farmers do not castrate at all, preferring to leave this for their veterinarian when he happens to be on the farm. It can be done cheaply in this way and perhaps would be best in the end. Mature bulls should always be castrated by a veterinarian. On the other hand, many farmers are expert in castrating bull calves, ram lambs, and pigs.

Performing the operation

There are two common ways of castrating calves. The first method consists in grasping the bag or scrotum firmly

in the left hand and cutting off the lower quarter or third. This will leave the bag open on the end and the exposed testicles may be squeezed out as easily as peas from a pod. Pull the testicles down one at a time. Each testicle should be pulled out far enough so that one inch or more of its cord attachment is removed with the testicle itself. This will prevent the end of the cord from protruding from the open wound after the operation is completed. When the testicle is pulled out the required distance, it may be cut off with the knife if the calf is very young. Better still, and safer also, is to stretch the cord over the finger and scrape it with the edge of the knife-blade until it is completely severed. This will leave a rough lacerated surface to the cut end of the cord and will help to make the bleeding much less. All clean-cut wounds bleed more than ragged or lacerated ones. If the farmer desires, he may provide himself with an instrument called an emasculator. This is pincer-like and serves to crush off the cord, thus reducing the amount of bleeding. After one testicle has been removed, the other may be forced from its covering in the bag and removed in a like manner.

The second method consists in slitting the bag on each side, parallel to the middle line, separating the two testicles. Two long incisions are made, each directly over the testicle on either side. Grasp the bag firmly with the left hand and squeeze the skin tightly over the testicle. Make the incision or cut clear down to the end of the bag. The testicle can now be readily pressed out of its place. Make a separate opening over each testicle. One opening will not do for the removal of both testicles. In making the cuts or incisions, be sure to make a long cut down to the bottom end of the bag. This may seem unnecessary, but the resulting drainage from the wound will be better and there will be no pockets left to fill with dirt or infection. For the average farmer the first operation would be the easiest and the drainage is always satisfactory.

Bleeding is not usually severe in young calves, but older

animals may bleed considerably. When old bulls are castrated it would be advisable to use the emasculator to crush off the cord. In a large animal the blood-vessels in the scrotum and cord attachment of the testicles are much larger and do not easily stop bleeding. If the emasculator is not available, the cut end of the cord may be seared over with a hot iron. When the operation is completed, douse some of the antiseptic solution over the wound and turn the animal out on pasture.

As a rule, no after care is needed except to watch for excessive bleeding and to prevent infestation of the wound with maggots. If castration is done in fly time the wound should be smeared with pine tar to keep the flies away. The flies lay eggs in the open wound and these develop into maggots. These are a stage in the development of the screw-worm fly. If precautions have not been taken and maggots get into the wound, they may be destroyed by inserting a ball of ordinary absorbent cotton saturated with chloroform. When the maggots are killed with the chloroform, the wound should be washed out carefully to remove the dead maggots. After this apply pine tar to the wound to ward off further maggot infestation.

GOITER IN CATTLE

Goiter is not a new disease. Reports of this trouble have been made for centuries. This applies to both man and animals. Goiter may affect any of the farm live-stock. It is more common in some sections of the United States than in others. Goiter in man is due to the same cause and the entire northern half of the United States is often referred to as the goiter belt. It does not necessarily follow that this same belt indicates the prevalence of goiter in domestic animals. In fact, Ohio is rated high in goiter incidence in man, but the disease is relatively rare in live-stock. The reason for this is not known. Goiter is very common in nearly all kinds of stock in Washington, Oregon, Idaho, and Montana. Minnesota, North Dakota, Wyoming, Utah, and

western Canada also report many cases of goiter annually. In some of these states the losses from goiter in some kinds of live-stock have been so severe as to endanger the industry.

While goiter is more important in other live-stock, only calves will be considered in this chapter. The disease as it affects other animals will be treated in their respective sections. Goiter seldom affects adult cattle. There is a possibility that the disease does affect older animals, but the size and thickness of the neck may prevent discovery.

Goiter is an enlargement of the thyroid gland in the neck of the calf. The disease is usually congenital, that is, the animal is born with the enlarged gland. This type of goiter is seen more often in those calves born in the early spring months. It is a peculiar fact that on some farms the lamb crop may be ruined by an epidemic of goiter, while the calves are not affected. The reverse is sometimes observed. When animals have free access to sunlight, green forage and warm weather, the number of goiters is reduced. There are also seasonal and yearly variations when goiter is likely to be more common than usual. An epidemic may appear suddenly in a section of the goiter belt where no trouble was reported previously. In the northwest states it has been noted that the live-stock in the valleys suffer most while those on high ground or on hillsides may escape. When cattle are shipped from sections where goiter is not prevalent into another state, such as Montana, they do not have any immunity. Consequently, they are as likely to give birth to goiterous calves as the native cows.

Cause of goiter

The cause of goiter is a shortage of iodine in the food and water. In man, whenever the water and soil are low in iodine, there is sure to be a high rate of goiter. It was formerly thought to be an infectious disease carried in water. This is not true, for whenever the proper amount of iodine exists in water, goiter is rare. The shortage of iodine

in the food and water may not be the sole cause of congenital goiter in calves. There may be some other factor which prevents the assimilation of iodine, even though it may be available. However, goiter occurs only in districts low in iodine of soil and water. The resulting crops grown in these areas would also contain less than the normal quantity of iodine.

Symptoms of goiter in calves

It should be easy to recognize goiter (Fig. 6). It is seen shortly after the calf is dropped. Most calves with goiters

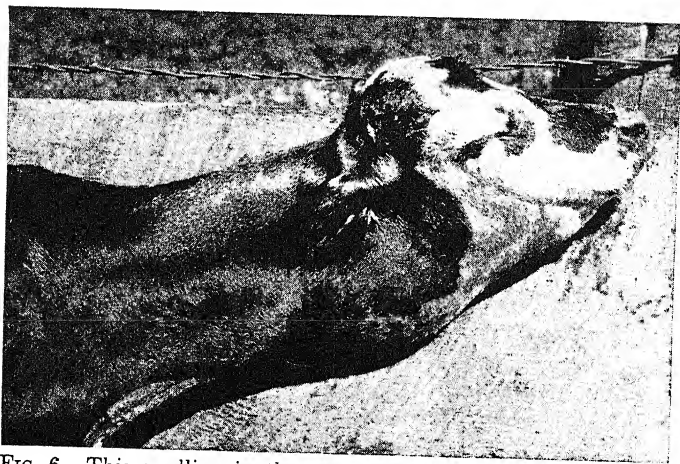


FIG. 6.—This swelling in the neck is typical of goiter in calves.

live and develop without hindrance. As the calf grows the goiter is not so noticeable, and many times decreases in size. Regardless of what takes place in the gland, when the calf reaches eight to ten months of age the goiter is seldom noticed.

The stockman often calls these animals with goiters, "big neck calves." The swelling in the neck may be as big as a man's fist or even larger. It is unsightly and the breeder

of pure-bred cattle may find that it interferes with the sale of the animal. A calf with a goiter does not appear ill and may be as frisky as though it was not affected. Some calves may be born without hair, as in the case of hairless pigs. The prevalence of goiter in the calves on a farm may vary from year to year.

How to prevent goiter in calves

Goiter in calves may be prevented by supplying additional iodine to the cows during pregnancy. The easiest way to do this is to furnish the cattle with salt containing 0.02 per cent iodine. If this is used the year around there should be no danger of calves being born with goiters. If the salt is bought already mixed, either as bulk salt or in the customary block form, care should be taken to be sure it contains the above percentage of iodine.

It might be safer for the farmer to mix his own salt. This would insure a proper mixture. Secure any of the finer grades, such as finely crushed rock salt or what is commonly termed hay salt. Add to this 1 ounce of granular potassium iodide for each 300 pounds of the salt. First mix the ounce of potassium iodide with a pound of the salt. When this is ready, spread the 300 pounds of salt on a cement or other smooth and tight floor. Spread the salt out in a thin layer about three inches deep. The pound of mixed salt and potassium iodide is now sprinkled over the layer of salt. Shovel the resulting mixture over several times. The salt may now be sacked and stored in a dry place out of the sunshine.

If the iodized salt is not used the year around, at least it should be fed beginning in November and from then on through the winter. Do not put out more of the salt than the animals will consume in three or four days. Place the box containing the salt under shelter, so that it will not be rained on.

One should not make the mistake of using the ordinary medicated salt. There is much of this sort on the market.

Most medicated salts are merely a combination of common salt with some other chemical such as sulfur. This would not be effective in the prevention of goiter. The old-fashioned stock tonic will not serve unless it contains the necessary amount of iodine and is fed continuously. Either mix the salt at home or buy salt specially prepared for goiter prevention. Potassium iodide may be purchased at any drug-store. The granular form is best.

CHOKER

Choking is a common occurrence in cattle. Autumn is the usual time for it to appear. Choke is caused by an obstruction of some kind in the back part of the mouth or throat and even far down in the œsophagus or gullet. It is a serious condition and, unless the animal is promptly relieved, death may follow.

Cause

Choke may be caused by swallowing anything too large to pass through the gullet. Cows frequently choke on such roots as potatoes, turnips, kohlrabi, mangles, beets, or turnips. Large pieces of pumpkins and apples often become lodged in the throat. Some cows have a mania for eating sticks, tin cans, and bones. These usually cause trouble. A cow is a rapid eater, being in about the same class as a dog in this respect. A dog fortunately has a relatively larger gullet in comparison with its size and, therefore, does not suffer as much as the cow. Under certain circumstances a cow may attempt to swallow almost any object. The effect would be the same whether the object were a potato or a bone. The potato would be easier to remove because the bone is likely to have sharper points which would stick into the sides of the gullet.

Symptoms

The cow stops eating and looks very uneasy. It may cough, gasp for breath, and even try to vomit. Saliva some-

times drips from the mouth. If the object swallowed is large, it may be seen as a swelling in the neck and may be felt with the hands by manipulating the neck muscles. In nearly all cases of choke the animal is likely to bloat rapidly. This would appear about the same as ordinary bloat caused by eating alfalfa or sweet clover. The paunch swells and becomes greatly distended in the hollow just in front of the left hip-bone. The bloat may be caused by the inability of the animal to belch gas naturally. It is possible that the cow might actually suck in air while attempting to swallow the obstruction.

Treatment

The owner may often be of assistance in relieving the animal before a veterinarian arrives. Examine the cow carefully and try to locate the object lodged in the throat or gullet. Never give any liquid medicine. If the owner is careful to protect his hands from injury by the cow's teeth, he may explore the back of the throat with the hand and often succeed in finding and removing the object if it is lodged in the back part of the mouth cavity. If the lodgment is lower down in the gullet and seen plainly from the outside, the neck may sometimes be massaged and the object gradually forced back up into the mouth. From here its removal is simple. Do not use a whip stock or broom handle to push the obstruction down. This is likely to cause a rupture of the gullet and usually serves to make matters far worse.

If a root or an apple is swallowed, the use of a twisted double strand of wire several feet long with a slight hook on the end is sometimes successful in removing the obstruction. This consists in fishing for the object with the wire hook far down the throat of the cow. This procedure is always accompanied by more or less danger.

Sometimes an animal will recover without help of any kind. Do not give water, but leave some in front of the animal. She may help herself in small amounts and per-

haps succeed in swallowing the object. If the obstruction is not too large, the walls of the gullet may relax sufficiently to permit the object to slide on into the stomach. If simple methods such as reaching for the object by hand and rubbing the throat fail, it is always best to call a veterinarian. In some instances it is necessary to operate on the cow and take the obstruction out through the neck. Do not wait until the animal is exhausted before calling for help. Do not administer oils or other liquids. Frequently they cannot pass the obstruction and may turn off into the windpipe and drown the animal. If bloating is severe, tapping may be necessary.

Cows should be kept out of an apple orchard in autumn. Apples frequently cause choke. When potatoes and other root-crops are plentiful, it is customary to feed considerable amounts to cows. Be sure the roots are sliced in small pieces, ground, or in pulp form. Never throw large pieces of pumpkins to cattle. If reasonable care is taken, choke would be a rare occurrence on most farms.

BLOAT

Bloating in cattle is frequent. It is often called tympany and hoven. Bloating is caused by the formation of gas in the paunch or rumen. The rumen is another name for the first stomach and is a storage reservoir for food. The animal takes time to chew her food later on.

Cause

Bloat may be caused by the fermentation of frosted roots, cabbages or potatoes in the rumen. The consumption of large quantities of such forage crops as alfalfa or sweet clover may induce bloating. When such fresh easily fermented forage is eaten, the action of certain bacteria or germs may be so rapid that the gas produced cannot be carried off fast enough. Bloating naturally follows. The stomach construction of cattle and sheep is especially favorable for this condition.

Bloating is also seen in choke when the obstruction in the throat makes it impossible for the animal to belch gases naturally. It is dangerous to move cattle from a dry feed lot on to pasture or from one kind of pasture to another. They should be broken in gradually. This is especially true when the pasture is wet after a heavy dew or rain. Any easily fermented feed may cause bloating in cows. In some sections of the United States where alfalfa and sweet clover are used extensively as an important pasture crop, one hears of a number of cases of bloat. Some farmers have had so much trouble with it that they have plowed excellent fields devoted to these legumes. The fact that bloating happens at times when cows are pastured on these legumes does not furnish a good reason for condemning them generally. The suggestions given under prevention of bloat will obviate most of this difficulty. It should be remembered that some cows are chronic bloaters, that is, they seem to fill up with gas on the slightest provocation and under conditions when no other animals become affected.

Symptoms

An animal suffering from bloat is easily recognized. If the herd is not seen for some time, an animal may be found dead in the pasture. This would make it difficult to tell whether bloating took place before or after death. In some instances, when the cows come in from the pasture in the evening, one or more of them may be bloated. The swelling is greatest in the region of the left flank, high up, and near the hip bone. The skin may be distended and as tight as a drumhead. The animal appears uneasy, switches its tail, and may attempt to kick the abdomen. If the swelling is great, breathing may be hindered slightly. The breath comes in short gasps and the mouth is often held open in an effort to assist breathing. The pulse is likely to be very faint. The animal sometimes moans, staggers about, and if help is not given, dies in convulsions. While these

symptoms are fairly constant, the swelling alone is sufficient for most farmers to recognize bloat.

Treatment

If the animal is only slightly bloated, exercise may be all that is necessary. Some advise running the animal, but this is not considered good practice. A mild bloat may be relieved by merely placing a piece of rope, smeared with pine tar, through the mouth and tied back of the horns. This will cause the animal to chew the rope and the flow of saliva will be increased. The cow soon starts to belch gas and the swelling in the flank often goes down without further treatment. It is useless to dash cold water against the sides of an animal affected with bloat. The mouth gag and slow walking will help most of the mild cases.

If the bloating is severe and the animal is breathing with great difficulty, it will be necessary to give immediate relief. This is done by tapping or puncturing the rumen and allowing the gas to escape. Tapping is best done with a trocar and cannula. Both of these instruments may be purchased from any stockman's supply house. It would be well to have these instruments at hand for just such cases of emergency. If the owner does not possess a trocar, some neighbor probably has one. If one is not available and a veterinarian cannot be secured, an ordinary pocket knife will suffice. This, of course, is a crude operation and is not advised except in an emergency. Make the puncture directly over the place of greatest distention. Push the trocar and the cannula through the skin and on through into the rumen. Pull out the trocar and the gas will immediately escape from the opening in the cannula which is left in the animal. Pour into the paunch through the opening in the cannula, a pint of warm water in which has been mixed a teaspoonful of lysol or some other coal-tar disinfectant. Allow the cannula to remain in the side of the animal until the bloating or fermentation in the rumen ceases. It sometimes happens that certain animals need to be

tapped the second time. When this is necessary, the cannula should be left in for some time. It may be necessary to hold it in place with adhesive tape.

After an operation of this kind and also in those cases in which tapping is not resorted to, the cow may be given 2 ounces of aromatic spirits of ammonia in a quart of water. Two-ounce doses of turpentine may also be administered. Mix the turpentine with a simple sirup made from sugar and water. Give as a drench from a long-necked bottle and repeat every hour until relief is permanent. Some farmers have used formalin in 1-ounce doses mixed with a quart of water.

When the cow has recovered from the immediate effects of the bloating, it may be given a pound dose of Epsom salts to keep the bowels moving. Provide easily digested feeds for a few days until the animal recovers from the effects of the illness. Whenever one or two individuals in a herd show evidence of bloating, it is good practice to examine the remainder of the animals carefully so that none may be overlooked.

Prevention of bloat

While cattle may bloat on other kinds of pasture crops, alfalfa and sweet clover are the worst offenders in this respect. In some communities these crops are often entirely discarded because a farmer in the vicinity lost several cows from acute bloat. On the other hand, thousands of cows are pastured on alfalfa and the clovers without any harmful results. Some farmers have more trouble with bloating in their cattle than others; doubtless they are partially to blame.

Alfalfa and the clovers are highly nutritious and a few shortcomings should be overlooked or guarded against. It is said that there is less danger of bloating on sweet clover than on alfalfa. Cows should not be turned on to either alfalfa or sweet clover for the first time after a heavy dew or rain. Neither should they be ravenously hungry. They

should not be allowed to spend the entire day in such a pasture until they have become accustomed to it. It is such a luscious green that they are likely to eat too much. Some feeders give the herd a partial fill of hay in the barnyard before they are turned into the pasture. This would help to prevent overloading the animal with the green leaves which cause fermentation and subsequent bloating.

If there is no water supply in the pasture, it is not wise to allow the herd to remain there all morning and then drive them to the barn at noon and let them have their fill. This practice alone has caused numerous cases of bloating. Either supply water in the pasture where animals can take it in reasonably small quantities or do not permit them to have their fill in such a short time.

It is claimed by some farmers that if part of a straw or hay stack is left in the pasture from the year before, the cows will stop feeding on the green leaves and adjourn to the stack for the sake of variety. If this is true, it would undoubtedly prevent overloading the stomach with greens. It is difficult to believe that animals will leave such delicious forage to eat straw or dry hay, but the testimony of so many farmers would make it seem worth trying.

NAILS OR WIRE IN THE HEART

When cows swallow nails, wire, lead-pencils, knife-blades, or hair-pins, these sharp-pointed objects sometimes find their way into the heart itself. This disease is technically called traumatic pericarditis. This means a mechanical injury to the heart with a subsequent inflammation which usually proves fatal. It is common enough on farms to deserve mention at this time. Cows seem to have a natural hankering for such objects as those mentioned and many losses have occurred from this cause. This is especially true when new construction work is going on in the barn and nails are left carelessly about. On many farms baled hay, straw, and shavings are used. When the baling wire is not picked up at once, cows frequently find and swallow

the short ends. The wire clips used in fastening some kinds of feed sacks have been found in the hearts of animals dead of this disease. It behooves the farmer to exercise a little care to prevent unfortunate happenings of this nature.

Cause

Any sharp-pointed object may bring about this trouble. A piece of baling wire, for example, is swallowed. It passes down into the second stomach or reticulum. As the digestive processes proceed, the walls of the reticulum move and the wire slips down to the bottom of this sac. After a time the continual movement of the food contents causes the wire to penetrate the walls of the reticulum. A short distance of about two inches separates the walls of the reticulum from the heart. In between lies the diaphragm. After the wire punctures the reticulum, it continues on through the diaphragm and eventually works its way into the sac surrounding the heart and even into the heart itself. This may sound far-fetched, but it happens often enough to make it a grim reality on many farms.

Symptoms

The farmer will seldom be able to recognize this form of heart disease. The actions of the affected animal vary so much that an exact description of the symptoms is almost impossible. Frequently a diagnosis is not made until after the animal dies and the carcass is examined. There may be, however, evidence of pain and irregular appetite. The breathing may be jerky, and some stockmen think they can detect a splashing sound if there is a large quantity of fluid in the chest cavity. If the nail or wire does not penetrate into the heart itself, it may be finally surrounded by new tissue and death delayed indefinitely.

A diagnosis may be made and when the animal dies the post-mortem examination will reveal the nail or wire sticking into the heart. In some cases the animal drops dead without having appeared sick at all. If it were possible to

use the X-ray, a positive diagnosis might be made earlier in the course of the disease.

Treatment is never attempted. Whenever a positive diagnosis can be made, the owner is advised to slaughter the animal at once. If the carcass is in good flesh and the infection about the heart not extensive, it may be used for food.

MINERAL POISONS

Cattle are sometimes poisoned from such substances as white lead in paint, arsenic in paris green, and phosphorus in the various kinds of rodent poisons. Copper sulfate or blue vitriol could cause losses if bordeaux mixture were allowed within reach of cattle. Common salt might poison an animal if it was mistaken for Epsom salts and given in a large dose. Such cases as these frequently occur on farms. A brief description of the symptoms shown by cattle when poisoned by some of the common minerals is given. Treatment for poisonings of this nature is the best available, but it should be understood that antidotes for poisoning in cattle are not highly successful. The reason is simple. Usually the animals have received excessively large amounts of the poison and the owner often fails to discover the cause of the trouble until the individual is nearly dead. The diagnosis or recognition of the different mineral poisons is fairly difficult, especially when it is impossible to find the source of the particular poison that is suspected of causing the sickness.

Lead poisoning

This is the commonest type of mineral poisoning in cattle. In most cases it is caused by licking fresh paint from stanchions, fence-posts, and the like. Fresh paint anywhere may produce this disease. Sometimes an empty paint pail is left within reach of cows. Paint, for some unknown reason, is attractive to cows. Whenever an animal finds a discarded paint pail, it is likely to be licked clean. The

owner usually forgets the existence of the pail and the illness of one cow could easily turn into an unsolved mystery. When steel stanchions are being repainted, it is often customary to scrape off the old paint first. This dry paint is very poisonous to cattle. Any of the ordinary forms of lead will poison cattle. Red lead, sugar of lead, and white lead used in paint are the common forms encountered.

Lead has what is known as a cumulative action in the body. By this is meant that it is not rapidly eliminated from the affected animal, being more likely to be stored up in the tissues and passed out very slowly. The lead remains in the internal organs for a long time and passes out slowly through the bile, urine, saliva glands, and skin secretions. The poisonous dose for a cow is about 720 grains.

In the early stages the symptoms of lead poisoning are difficult to differentiate from some other diseases or poisons. Two kinds of lead poisoning are described, acute and chronic. The acute or quick-acting type would follow large doses of lead. The chronic type refers to animals that consume small quantities of lead through contaminated water over a long period. The onset of the chronic type is slow.

In the acute or quick-acting form, the affected animal may show signs of abdominal pains, acting as though it had a colic. There may be grinding of the teeth, a discharge from the nose, and slobbering from the mouth. Constipation is observed. The manure is likely to be hard and dry. The breath is foul. Blindness and muscular spasms follow this stage and still later the animal may appear to sleep. Before the sleeping stage is reached, there may be some signs of delirium. The cow may fall down in some unnatural and awkward position and make no attempt to become more comfortable. The urine is often ropy or stringy. The symptoms mentioned may take a day or two to develop. Much will depend on the amount of lead consumed, the degree of elimination, and the resistance of the animal.

In the chronic or slow-progressing form of lead poisoning,

a lead line appears on the gums. The symptoms are slower to appear and are not so pronounced as in the acute type. Chronic lead poisoning is more common in districts where lead mining is a business. Waste products from such a mine often soil the water supply when the water refuse from the mill is permitted to drain into a stream. If the stream is used to furnish water to cattle, this would lead to poisoning by degrees. Water which contains as little as one-tenth of a grain of lead to a gallon is considered unfit for drinking purposes. The continuous use of such water would lead to an inflammation of the intestines accompanied by the usual pains of colic and subsequent paralysis. The so-called lead line is a blue line seen on the margin of the gums. This is the last symptom and is almost always confined to the chronic form. The chronic type of this disease may extend over a period of several weeks until the animal has reached the limit of its tolerance of lead. Death follows.

No treatment is of any value unless the lead supply is taken from the animals. When it has been definitely established that lead is the cause of the trouble, the animal may be dead. Sometimes an examination of the contents of the stomach and intestines is necessary to find the lead. This is a laboratory test. If, however, animals are consuming only small quantities of the lead daily when silage is being fed from a recently painted silo, something can be done to hasten the recovery of the affected cows. If a paint pail or newly painted fence-posts are to blame and some of the sick cows are still alive, treatment may be of considerable benefit. First, give the sick animal a big dose of Epsom salts. Administer from 1 to 2 pounds dissolved in warm water. When the animal is in the delirious stage it is sometimes advisable to give potassium bromide in $\frac{1}{2}$ -ounce doses every four or five hours until the nervous symptoms have subsided.

As a preventative, be careful always to keep cattle away from freshly painted stanchions, barns, and fence-posts. If calves are fed from freshly painted pails poisoning may

follow. Allow the silo to dry out thoroughly before silage is put into it. Do not mix paint in the barn where an empty white lead container might be carelessly set aside. Cows like lead and will eat it readily. If paint is to be scraped off from old surfaces, be sure to dispose of it properly.

Arsenic poisoning

It is surprising that more cases of arsenic poisoning are not reported on farms. Arsenic is common in various farm operations and is a part of many preparations. Arsenic is used in the form of paris green. It is also an important part of many live-stock dips and rat poisons. Many stock tonics and condition powders contain arsenic. These have been known to cause poisoning. Used properly, arsenic is of value, but serious accidents sometimes follow careless handling. Paris green is almost universally employed to destroy many insect pests and unless care is exercised live-stock may be poisoned. When farm animals are dipped in preparations containing arsenic, they should not be permitted to drain off in yards where fodder is stored. Poisoning has been reported from licking dry dips. Arsenic pastes used as rat poisons should be handled in such a way as to prevent other farm animals from having access to them. Arsenic poisoning may be caused by the contamination of water and forage in the neighborhood of a smelter when refuse containing arsenic is allowed to drain into a stream. Arsenic is employed in veterinary medicine as a drug. When used by uninformed persons in too large doses, poisoning may occur. Arsenious oxide and its salts are the commonest forms of arsenic. Arsenic, unlike lead, is eliminated from the body rapidly through the kidneys. The poisonous dose for a cow is from 200 to 700 grains.

The sudden appearance of violent colic pains, together with excessive thirst, straining and diarrhea should make the owner suspicious of arsenic poisoning. The recent use of preparations containing arsenic will help to make recog-

nitition easier. The manure from the animal may be streaked with blood and stringy blood-stained shreds from the inside lining of the intestines may be noticed. The manure has a very offensive odor. These symptoms continue until the animal is in a state of collapse. When extremely large quantities of arsenic are consumed, the course of the disease may be so rapid that the animal may be ill only a few hours. At times, when the disease is more prolonged, there may be a period showing paralysis of the hind parts, coldness of the ears and horns, together with trembling, dullness, and convulsions. This is followed by complete collapse. The chronic form of arsenic poisoning, so often observed in man, is not frequent in cattle.

The treatment of arsenic poisoning is to supply an antidote to neutralize the effect of the poison already in the animal. The usual solution for this purpose is called hydrated oxide of iron. This should be made up fresh by dissolving 4 ounces of iron sulfate in $\frac{1}{2}$ pint of water. To this is added $\frac{1}{2}$ pint of water in which has been mixed 1 ounce of powdered magnesia. The magnesia does not readily dissolve and merely remains in suspension. The entire mixture is given as a single dose. If the amount of arsenic taken by the animal is large, the dose should be repeated in an hour. If this treatment cannot be given, water used by a blacksmith's forge is said to contain sufficient iron filings and iron scale to have a beneficial effect. However, a blacksmith's forge is often as difficult to reach as the drug-store, where the ingredients of the first treatment may be obtained. Barley water is helpful to allay the inflammation in the stomach and intestines and to supply nourishment. If the animal is in great pain, it may be necessary for the attending veterinarian to give a dose of morphine.

The following precautions should be observed: Be careful of paris green insecticides. Use rat poisons with caution. When employing dips containing arsenic, allow the animals to drain off in some place where forage cannot be soaked

with the dip liquids. Move the dipped animals briskly for a few minutes so they will shake off any excess moisture. Animals may sometimes poison themselves by licking the hair of others that have been dipped in any of the arsenical dips. This is usually caused by overcrowding the dipped animals in a small inclosure. This applies to sheep especially. Do not use arsenic as a drug unless the dose is fully understood.

Phosphorus poisoning

While phosphorus poisoning is not common in cattle, it could easily occur and pass unrecognized. The kind of phosphorus usually termed "ordinary" is yellow in color. This form is used extensively in the preparation of rat and mice pastes and in the manufacture of matches. Red phosphorus is not considered poisonous. The poisonous dose of yellow phosphorus for cattle is from 5 to 30 grains.

Poisoning from phosphorus is indicated by loss of appetite, colicky pains, diarrhea, and sometimes paralysis of the throat. The course of phosphorus poisoning is very rapid. If a large amount of phosphorus is consumed, the odor may be detected on the breath of the animal. Phosphorus has an odor resembling garlic. Vomiting occurs in other animals except ruminants. In the dark the breath and manure may glow in ghostly fashion.

In treating do not give oils or milk. First give the sick animal a big dose of Epsom salts, $1\frac{1}{2}$ pound dissolved in water. Turpentine is then administered, mixed with a tea made from flax seeds. The dose of turpentine is from 2 to 4 ounces; give as a single dose mixed with the tea.

Other mineral poisons

Some other minerals and acids may cause poisoning under unusual circumstances. A few will be mentioned here as possibilities. Carbolic acid or phenol and certain of its compounds, such as creosote, cresol, and cresylic acid, have been known to poison cattle. It is becoming increasingly com-

mon to use creosote for painting and preserving the inside of silos and water storage tanks. A case has been reported in which several cows were killed following the drinking of water heavily charged with creosote from a newly painted tank.

Common salt may, under extraordinary conditions, cause death. The poisonous dose of common salt is given as 3 to 7 pounds. This is not exact, of course. An animal may be starved for salt and eat more than is good for it. An overdose of common salt might occur when this was used instead of Epsom salts.

Bichloride of mercury poisoning is not uncommon. This is a common chemical added to water for douching the genital organs of cows. Cattle are specially sensitive to this form of poisoning and great care should be taken not to make this antiseptic too strong. Many cows are permanently rendered useless as breeders from such practices. There are many other and better antiseptics than bichloride of mercury and none is half as dangerous.

The widespread use of lye as a germ-killer on the farm has led to cases of poisoning from this agent. While lye poisoning is not as common in cattle as in pigs and chickens, it occurs often enough to warrant a word of caution.

Kerosene is a household cure-all on many farms and poisoning has followed its use. Kerosene is of no particular value in veterinary medicine, so it could well be dispensed with as part of the farm medicine chest.

PLANTS POISONOUS TO CATTLE

Poisonous plants have caused heavy losses to range livestock. Eastern and midwestern farmers seldom report trouble of this kind. It is easy to fix the blame for the death of cattle on a certain plant, especially when proof to the contrary is lacking.

Some farmers think that animals are easily killed by eating a small quantity of poisonous weeds. Animals do not always become suddenly and violently ill after eating a few

stalks of some admittedly poisonous plant. To become poisoned, it is usually necessary to consume large quantities of such plants. When tests of suspected plants are made, a sufficient quantity may not be available and the test, therefore, fails to convict a weed that really is dangerous. The sample of weeds submitted is so small that a fair test is impossible, because it may require a longer period of feeding to approximate the same conditions that existed on the farm where the suspected poisoning occurred.

Most live-stock are poisoned because there is little or nothing else to eat. This applies especially to range conditions. Animals do not eat poisonous plants because they like them, for in most cases they are positively distasteful. Ordinarily, animals are driven to eating such plants by starvation. An apparent exception of this statement is in the case of loco poisoning. Animals often show a taste for this weed and seek it when other and better forage is at hand, but the taste is originally acquired by the lack of other forage.

The actual number of plants poisonous to cattle is very few. This is contrary to the common conception. Many are comparatively easy to recognize and range cattlemen are now familiar with the plants to be avoided. As a result of this knowledge, the poisoning of live-stock on the range is becoming less each year. Formerly it was the custom to group all poisonous plants in one class and call them poison weeds, without any particular attempt to separate the different kinds.

Over-grazing is the direct or indirect cause of range poisoning. The most palatable plants are eaten first and the others, being naturally obnoxious, are left to the last, and are consumed only under pain of starvation. On some over-grazed areas, especially in dry seasons, little is left but the poisonous kinds of plants. Under such conditions water-hemlock roots, for example, may be pulled up and eaten when, with plenty of nutritious forage, they would not be touched.

As a rule, there is no treatment for animals suffering from the effects of plant poisoning. The only exception is in the case of loco poisoning of cattle. If animals were well fed and cared for, plant poisonings would be rare.

A short description of some of the more common poisonous plants that may injure cattle follows. Most eastern and many western farmers will fail to recall any except prussic acid, cockle-bur, snakeroot or water-hemlock. The common weeds poisonous to other live-stock are discussed in their respective sections. In some cases the plants discussed here are poisonous to other stock as well.

Whenever plant poisoning is suspected, it would be best to check up on the other poison possibilities such as lead, common salt, arsenic used in sprays and weed-killers, or some unusual contagious disease not ordinarily encountered in the particular territory. It is easy to call a disease plant poisoning when one is at a loss to attribute it to anything else. Plant poisonings are rare in the eastern and central states.

If in doubt as to the identity of a certain weed, a sample, if possible the whole plant, should be sent to the botany department of a state agricultural college. An examination will usually be made free of charge. It is difficult to identify some plants without the entire stalk, roots, leaves, and flowers. The plant should be wrapped in several thicknesses of moist paper, packed in a pasteboard box, and mailed by special delivery. One should send a full description of the conditions under which the plant grows and the symptoms shown by the sick animals.

Ergot

Ergot is a fungus or parasite which attaches itself to seeds. Ergot poisoning occurs through eating cereals which contain the fungus. It frequently develops on grasses grown on rich soil and is said to be more common in hot damp seasons. While it may affect redtop and oats, it is more

often seen on rye and blue-grass. The seeds affected by the fungus are several times as large as the natural ones. Cattle suffer most from ergot poisoning.

The absorption of the poison affects the blood-vessels, especially in the extremities, such as the ears, tail, and feet. There may also be some stimulation of the nervous system with spasms and extreme excitability. As the disease progresses, there is a loss of sensations and the blood supply to the ears, tail and feet is reduced to the extent that these appendages sometimes slough off. Ergot is often accused of bringing on abortion by contraction of the uterus. Such cases are rare.

The best treatment is to change the feed and apply local antiseptics to the affected parts. The animal should be given a big dose of black coffee. One or two quarts would not be too much. This will serve as an excellent stimulant. If the disease is well developed, the treatment is very tedious.

Water-hemlock

Water-hemlock is also called cowbane and poison-hemlock. It is without doubt one of the most poisonous plants. It is a hardy hollow-stemmed perennial 3 to 7 feet tall. It branches freely. Water-hemlock may be distinguished from wild parsnip by its white umbrella-like clusters of greenish-white flowers. The plant has a short thick fleshy root that resembles clusters of small sweet potatoes. Water-hemlock grows along wet roadsides, ditch banks, and other low moist places. It is very poisonous to cattle, sheep, and hogs. The poisonous parts of the plant are the young sprouts and the tuberous roots. When wet bottom land is plowed, the water-hemlock roots may be turned up and cows sometimes eat them.

The affected animal appears crazy with pain, rushes about, falls down, and rolls over and over. Cows sometimes bellow, froth at the mouth, grind their teeth, and try

to vomit. Treatment is useless. The sick animals usually die within an hour after the first symptoms appear.

Oak

In some parts of the United States oak leaves and acorns are considered poisonous to cattle. Reference is made to the young leaves and buds. It is no doubt true that an exclusive diet of oak leaves may produce a digestive disturbance. In spite of this, many farmers find oak leaves nutritious, and this often forms an important part of the feed of cattle. Herds usually come in from oak ranges in excellent condition. If there is any forage besides the oak leaves, no bad effects are likely to be observed. The sick animals may show some evidence of constipation and are usually thin. It would appear, then, when oak leaves are used without any other forage that simple malnutrition results. No treatment is necessary, except to put the animals on good feed and the trouble will disappear.

Cockle-bur

The cockle-bur is a coarse rough annual, 1 to 4 feet tall. The seed-burs are the most conspicuous part of the plant. They are about an inch long and are covered with spines or "prickers." Each bur contains two dark green seeds. This plant is poisonous to cattle, sheep, and hogs. It was formerly thought that death was caused by the mechanical injury produced by the presence of these burs in the stomach and intestines, or in the throat, but they are now known to be poisonous also. Poisoning takes place only when the plant is in the two-leaf stage. If other feed is plentiful, cattle and sheep are not likely to eat cockle-burs.

Range cattle are usually found dead. When the sick animals can be observed they usually stagger, breath hard, and show evidence of pain and paralysis. Death follows. Treatment is not very successful but some farmers have used small doses of raw linseed-oil with beneficial results. Bacon grease might be tried.

Prussic-acid poisoning

Prussic acid is technically called hydrocyanic acid. It is a very quick-acting poison. Prussic acid exists in small amounts in the leaves of wild cherry trees and in the seed-kernels of peaches, plums, cherries, and bitter almonds. It may be found also in the sorghums, including Sudan-grass. The leaves of wild cherry trees and the grasses are especially dangerous when they are wilted. Sorghum or Sudan-grass are harmless when cut and thoroughly dried. Wilted cherry leaves, wild or tame, are poisonous. Trimmings from these trees should be kept away from live-stock. Branches broken off in storms or cut off by telephone line-men should be placed out of reach of animals of all kinds.

The affected animal becomes drowsy and staggers drunkenly. It appears very weak, the breathing is labored, the muscles twitch and saliva flows freely. The animal dies from paralysis of the respiratory system. The affected animal is moved to a shady place and its head raised to assist breathing. Administer 1 ounce of baking-soda and $\frac{1}{2}$ ounce of iron sulfate. Dissolve each drug in a pint of water and mix to make a quart altogether. Give this quart mixture as one dose.

White snakeroot

White snakeroot is a slender erect perennial which grows from 1 to 5 feet tall. It is found in many parts of the United States. The plant has clusters of white flowers and spear-shaped leaves. It causes a disease called trembles and may be fatal to cattle, sheep, and hogs. Horses are rarely affected, perhaps because they do not have an opportunity to eat the plant. The poison from this plant may be carried through the milk and produce death in man. Such cases have been reported.

Cattle show sluggishness and lack of condition. Later they become trembly, this being evidenced by continuous twitching of the muscles, followed by spasms. The breathing is irregular and difficult. Not all cows, even though they

may be exposed to the same grazing conditions, develop the disease.

When symptoms appear the affected animals should be removed to other pastures. Try to locate and identify the weed. Administer a pound dose of Epsom salts. Provide laxative feed and do not use the milk from the sick animals.

Larkspur

There are two common species of larkspur, tall and low. These larkspurs are hardy perennials and grow in damp sheltered places. The low species ranges from 1 to 2 feet in height, while the tall larkspur sometimes reaches a height of 7 feet. The flowers range through the several shades of purple. The low larkspur is poisonous during its entire life. The tall larkspur is poisonous as a young plant but is only slightly so after it reaches the flowering stage. The tall larkspurs are not so common as the low ones. Poisoning is confined entirely to cattle. Range sheepmen consider themselves in luck when plenty of larkspur is on the range. Most of the trouble comes from cattle eating the leaves.

Cattle poisoned by larkspur are usually found dead. In the early stages, animals may develop unsteadiness of gait, stagger and suddenly fall down. Death is caused by paralysis of the respiratory system. If animals eat only a small amount of larkspur, they may stagger, stumble and fall, but often recover naturally without treatment.

Some poisoned animals bloat. If this happens, tapping should be resorted to. If possible the animal should be pulled in the shade and its head raised to assist breathing. Otherwise it should not be disturbed.

Loco

There are several species of loco plant. The three common kinds are the white, purple, and blue. They are so named because of the color of their flowers. The first two are the most common. The white loco or rattle-weed is widely distributed in the plains region east of the Rocky

Mountains, from Alaska to Mexico. It is a stemless plant with short clusters of flowers. It is poisonous to cattle, sheep, and horses.

The purple loco is sometimes called the true loco. It is most abundant in Texas but has been encountered in adjoining regions. The purple loco plant differs from the white in that it has a stem. Both the white and purple loco plants sometimes reach a height of 2 feet. Purple loco is especially poisonous to horses but may poison cattle.

The blue loco plant grows in the Southwest. This looks something like alfalfa. The blue loco affects horses chiefly, but has been known to poison cattle and sheep.

All loco plants produce similar effects. Animals must eat them for a long time before they show any symptoms. There is loss of flesh, staggering gait, and loss of muscular control. Many of the animals are extremely nervous and act crazy. When animals acquire a taste for the loco plants, they will seek them out and eat little or nothing else, even though other safe forage is at hand. A steer affected with this disease will often stand for hours at a time without moving or changing its position. It finally falls and dies. Treatment consists of removing the sick animals from the infested range and supplying good forage such as alfalfa.

PART II

DISEASES OF HORSES

CHAPTER VII

INFECTIOUS DISEASES OF THE HORSE

HORSES do not suffer from as many infectious diseases as cattle. They sometimes become infected with diseases usually associated with cattle, but the number is not great. It is rare to find a horse with tuberculosis, although a few cases have been reported. With the exception of tetanus all the diseases described in this chapter are exclusively confined to the horse family. Cattle have a disease called pink-eye, but this is not identical with influenza of horses. Swamp fever is not common but it occurs enough to make a discussion of it worth while. Glanders has been controlled to such an extent that its occurrence on the farm is extremely rare. It was formerly considered an important disease of horses and is included for its historical value.

GLANDERS OR FARCY

Glanders and farcy are the same disease. The name glanders is used when the disease affects the nostrils, lungs, and other internal organs. The term farcy is applied when the disease affects the skin. Glanders is the better name, because it covers both forms, while farcy refers only to the skin form.

Glanders is one of the oldest diseases recorded in the history of veterinary medicine. Written descriptions of it

date as far back as 450 B.C. Even then, long before its contagiousness was understood, the general recommendation was that sick animals be kept in fields apart. At that time many believed that glanders originated spontaneously, because the germ theory was unheard of. For centuries great European armies suffered heavy losses in horses. Glanders has been recorded in nearly every country in the world at some time or other. When large numbers of horses were assembled, this disease was of common occurrence.

Glanders was brought to America near the end of the eighteenth century and was carried into Mexico during the Mexican war. At that time the exact cause of glanders was unknown, but, urged on by the officials of several governments, work was begun to find the cause. As a result of this activity, great progress was made in the study of the disease and in 1882 Loeffler and Schuetz of Germany announced the discovery of the germ causing glanders.

Cause of glanders

Glanders is caused by a specific germ, producing the disease in horses, asses, and mules. Healthy animals become infected by coming in direct contact with diseased ones or by association in the same stables. Glandered horses frequently have a discharge from the nose and this often contaminates the water-pails, feed-buckets, mangers, and even feed and water. Stablemen may readily carry the live germs from one animal to another on the hands, harness, curry-combs, and bridles. It is probable that the old-time public watering trough also spread glanders. The germ may enter the healthy body through the digestive tract in feed and water, by breathing, and through abrasions in the skin.

When the discharge and ulcers in the nose pass unrecognized, the disease may easily affect a large number of animals. Glanders was formerly common in livery-stables and lumber-camps, where the general sanitation was none too good. The disease was usually introduced into a group

of horses through the purchase of an animal already infected. By the time the disease was recognized many of the other animals were affected. It takes at least two weeks for a horse to show noticeable symptoms after being infected. The present test for the disease and police methods of control have greatly reduced the incidence of glanders, until today it is almost unknown to most farmers.

Symptoms

Some animals may be affected for a long time and show no outward signs. Such individuals would be especially dangerous on this account. Glanders may be localized in the nose, lungs or glands and a horse with a discharge from the nose might be worked for months and still be in fair condition.

The general symptoms of glanders are the usual ones shown by an animal gradually becoming out of condition. There may be a rise in temperature up to 104° to 107° F. When the glands are affected they may be swollen and found to contain pus. The testicles may also be greatly enlarged and abscessed.

Most horsemen would consider the discharge from the nose of prime importance. At first this discharge may be watery, but later becomes thick and yellow in color. Only one side of the nose is usually affected. The lobes of the nostrils may be sticky and crusted with dried pus. If the inside of the nose is examined, the bony septum or partition separating the two nostrils may be covered with raw bleeding ulcers. The ulcers may be far back in the nose and out of sight. If glanders is suspected, the owner should never examine the nose, because this is exceedingly dangerous, for man is very susceptible to glanders.

Farcy or the skin form of glanders is usually a chronic or long-drawn-out process. The legs often swell and have a corded appearance with small swellings or farcy buds up and down. These buds begin as small lumps, but eventually break, become raw sores, and discharge pus. The same

kind of buds or sores may be found on the head, neck, and back.

Animals dead of glanders are seldom, if ever, opened. This disease is far too dangerous and the law does not permit a post-mortem examination. Man has been infected many times and for this reason great care should be observed in the handling and disposal of the carcass.

The test for glanders

Since no treatment is now attempted, all infected animals are destroyed. Before the present test was invented it was necessary to inoculate monkeys, donkeys, and dogs in the effort to identify glanders. The method in use today is called the mallein test. Mallein is a specially prepared agent and very reliable in the diagnosis of glanders. The mallein is instilled into one eye and the reaction or test consists in a discharge from that eye, while the other one remains unchanged. The mallein test is very reliable but should not be performed by farmers or other unskilled persons.

Any chronic or persistent discharge from the nose, with or without accompanying loss of condition, should be considered suspicious. Any animal with ulcer-like swellings or sores on the legs, face, neck, or back is cause for investigation. Glanders must be differentiated from common colds, strangles, or lymphangitis. The mallein test will do this readily and accurately.

All states have rigid regulations on glander control and the testing and disposal of carcasses are usually under the direct supervision of the state sanitary authorities. Whenever glanders is suspected, it would be best to get in touch with the local veterinarian. He will take the necessary steps to a proper diagnosis.

STRANGLES OR DISTEMPER

Strangles may be called by such other names as distemper, colt ill, and one type of shipping fever. It is one

of the commonest diseases of young horses, asses, and mules. Old animals are rarely affected. Strangles is recognized as contagious, but there is still some disagreement as to the specific germ or combination of germs responsible for it.

Cause

As mentioned before, this is a germ disease, but other factors have a direct bearing on the occurrence of strangles and must be considered in addition to the causative germ itself. It is an affliction of animals under five or six years of age. Badly ventilated stables and over-crowding bear their share of the blame. It is common to see animals affected when assembled in large numbers. Sales stables would furnish such a setting. Strangles is likely to be more prevalent during the damp changeable weather in the fall, winter, and spring months. Railway trips would upset an animal and thus lower its vitality, rendering it more susceptible, hence the term shipping fever. Showing at fairs would supply unnatural living conditions and perhaps exposure to infection.

Symptoms

There are two common types of strangles, ordinary and bastard. The ordinary form begins with dullness, rise in temperature, reddened eyes, and faster breathing. The animal goes off feed and appears uneasy. The eyes water and there is a straw-colored discharge from the nose. At first the discharge may be thin, but later charged with yellow pus. Young colts often sneeze and cough. Two or three days after the nasal discharge begins, a swelling may be noticed under the jaw. This is very tender and sensitive to the touch. The swelling increases in size and may finally come to a head and burst, discharging pus through the opening in the neck. After this the animal may feel better. The open abscess may continue to discharge pus for several days, gradually subside, and the animal recover. On the other hand, some animals do not fare so well. After

the swelling-in-the-neck stage, complications may arise resulting in pneumonia and death.

Bastard strangles is described as a catarrh of the passages and the lungs without the formation of the swelling or abscess in the throat. Abscesses, however, do occur in the glands of various parts of the body, even in the abdominal cavity. This type of strangles usually takes chronic form and may last for three or four months, frequently ending in death.

Treatment

Simple uncomplicated cases of strangles usually require very little treatment. Provide clean, dry, and well-ventilated quarters away from other animals. Use warm blankets to protect from undue exposure. If the animal has a fever, give a generous handful of Glaubers salts dissolved in water three times a day until the bowels are moving freely.

Hot applications to the throat may help to bring the swelling to a head, at which time it should be opened to permit the pus to drain out. Never apply blisters or liniments to the throat. Inhalations or warm fumes are helpful to relieve the breathing. Place a pail of hot water containing a teaspoonful of turpentine, oil of eucalyptus or beechwood creosote in the bottom of a sack. Hold the mouth of the sack over the nose of the animal and the fumes will be inhaled. Careful nursing is absolutely essential to the successful handling of this disease. Preventive vaccination is practiced with variable results. Keep the young stock away from all newly purchased horses, asses, or mules. Never permit the castration of young animals in an outbreak of strangles.

INFLUENZA OR PINK-EYE

Influenza is a widespread disease affecting horses, asses, and mules of all ages. It is frequently called pink-eye, epizooty and typhoid fever. Influenza in the horse is not the same as a similar disease in other animals. It is not

new, having been described as far back as 1301. The disease sometimes takes the form of an epidemic or, more properly, an epizootic. This means that large numbers of animals are affected over a wide range of territory. In modern times, influenza is more often confined to a single stable in which the younger animals are likely to be affected.

Cause

Influenza is a germ disease. It is thought to be caused by an invisible virus or germ assisted by certain other germs that enter the body after the way is prepared for them. The first germs enter the system, lower the resistance or vitality, after which the secondary or otherwise harmless germs take hold and the combination produces influenza.

Influenza is highly contagious. The disease may be brought into a barn through the purchase of animals from public sales stables or through the acquisition of a non-descript western broncho. It may be carried back to the farm when animals return from the county fair. Influenza is easily transmitted by food, water, grooming, and by the attendants themselves. It usually takes four or five days for an animal to show symptoms after becoming infected.

Symptoms

The horse becomes dull, refuses food, develops a fever and appears thirsty. There is a watery discharge from both nostrils. Later the discharge becomes thick and yellow in color. The pulse is rapid, breathing labored, and the eyes inflamed. If the disease does not assume any new complications, these symptoms may disappear and recovery follows.

Sometimes complications enter and pneumonia may develop. The horse coughs and actually fights for breath. The fever rises higher, the whites of the eyes turn yellow and the legs and breast may swell. Lameness is common at this time.

Treatment

Good nursing is more important than medicines. Place the horse in clean, dry, well-lighted and ventilated quarters. If this is done promptly, many will recover. If a laxative is needed, give $\frac{1}{2}$ pound of Glaubers salts to a 1,000-pound horse—more in proportion to size. Provide only light and easily digested feeds. If the eyes are inflamed and sore, bathe them with a mild boric acid solution, a teaspoonful of boric acid to 2 quarts of warm water. If the disease is complicated with pneumonia, call a veterinarian. For the prevention of influenza, keep all newly purchased horses by themselves for at least a week.

PURPURA HEMORRHAGICA

Purpura, for short, is a disease of the horse family and usually occurs after such exhausting diseases as strangles and influenza. Purpura is sometimes called horse scarlatina, being about as descriptive as the one already in use.

The cause of purpura is unknown. Many theories have been advanced, but as yet no germ has been discovered that will produce the disease when injected into another animal. Some investigators maintain that purpura is not contagious, even though more than one animal in the same stable is affected.

Symptoms

The attack may be mild or severe, beginning suddenly when an animal is in run-down condition after a siege of strangles or influenza. The first symptoms may appear over night and are evidenced by swellings in several different parts of the body, about the head, lips, legs, and abdomen. The swellings pit easily and are cold and not painful. The nose may swell so badly as to interfere with breathing, sometimes almost suffocating the animal. Swellings may disappear in one place and reappear somewhere else. The lining membranes of the nose, inside of the lips,

and about the eyes may show dark red or purple spots—hence the name of the disease.

The horse is very depressed, hangs the head, and breathes hard. Its ability to eat and drink is reduced and the swollen eyelids may hinder its sight. If the attack is mild, recovery may begin after four or five days. More often the disease is fatal, but when death does not take place, convalescence is very prolonged.

Treatment

Here again, good nursing is of greatest value. The owner should not attempt treatment with drugs of any sort, leaving this to the more skillful attention of a veterinarian. In severe cases destruction of the horse might be advisable.

SWAMP FEVER OR INFECTIOUS ANEMIA

Other names given to this disease are horse malaria, horse typhoid, and pernicious anemia. Swamp fever is a contagious disease of horses and mules. It is most prevalent in the midwestern and western part of the United States, France, Switzerland, and Germany.

Swamp fever has been definitely proved to be infectious, but the causative germ has never been identified. The blood of an infected animal contains the invisible germs or virus and will produce the disease when injected into a healthy individual. In this respect it resembles hog cholera and foot-and-mouth disease of cattle. Possibly the germs are so small that microscopes are not powerful enough to reveal them. Swamp fever is said to be more prevalent in wet years and especially on farms that are low and poorly drained. There does not seem to be much foundation for this belief. Swamp fever starts in the summer months.

Symptoms

Swamp fever may occur in two forms, acute and chronic. The acute cases may end in death two or three weeks after the onset of the disease. The animal becomes dull and list-

less in appearance, breathing is faster than normal, and weakness in the hind legs is apparent. The temperature may rise to about 105° F. and remain there. The heart is weakened and, as might be expected, dropsy of the lower parts of the body is frequent. The animal loses flesh rapidly and the final stages may include complete paralysis of the hind legs.

The chronic form of swamp fever takes a much longer time to develop and some animals may be sick for months or years. The appetite may remain good at first, but later becomes changeable. If the animal is at work, it tires easily and may sweat profusely. The eyes and lining membranes of the lips may show the yellow color of jaundice. Diarrhea occurs intermittently. As the disease progresses, the general weakness increases until the horse often staggers and falls. Help is frequently necessary to put it on its feet. Exhaustion finally hastens death. A few cases may recover, and when they do the animals act as carriers of the disease to others.

Treatment

No treatment for this disease is ever advocated. Horses known to be affected are better destroyed than treated, as they are a menace to other healthy animals on the farm.

This disease is not one of the easiest to recognize. Many farmers might suspect that worms were the cause of the trouble. The slow progress of the disease, covering at times weeks or even months, remittent fever rising and falling each day, together with gradual weakness and continued loss of flesh would be cause for investigation. A veterinarian or state sanitary officials should be consulted.

MOON BLINDNESS OR PERIODIC OPHTHALMIA

This disease is an inflammation of the interior of the eye and is curious in that it has a tendency to appear again and again in the same animal. This accounts for the periodic part of its name. It has been reported to be due to cer-

tain soil or climatic conditions, but this has never been proved.

While it is probable that a specific germ is responsible for this disease, none has ever been discovered. Various other conditions are thought to encourage the infection. Heredity is spoken of because moon blindness sometimes recurs in succeeding generations. Feed, stabling conditions, and the fact that the disease appears more commonly in low-lying farms, have caused many to think that environment plays a part. Constant eye strain, age of the animal, and exposure are also blamed. These, of course, are theories, nothing being known as to the real cause.

Moon blindness is seen in animals under six or seven years of age. It may appear suddenly, the animal being all right the day before. The eyelids may be closed and tears flow freely. The horse blinks in a bright light and the eyeball appears shrunken. The inflammation of the eye keeps on increasing until the eyeball becomes blurred. After a few days the inflammation may recede and the eye recovers its normal appearance. Several months may pass when the attack is repeated. Each attack leaves the eye in a more serious condition, until finally total blindness results.

Many methods of treatment have been tried with little or no success. No great progress can be made in the treatment of moon blindness until the exact cause is known and removed, or at least guarded against.

TETANUS OR LOCK-JAW

Tetanus is a specific disease of domestic animals and man. On the farm horses suffer most, but lambs frequently become infected after castration or docking. The germ causing tetanus lives in the soil, especially that adjacent to the barn. Most persons associate lock-jaw with the premature explosion of a fire-cracker held in the hand. Fourth of July brings many cases of lock-jaw in children, but this is because dirt containing the tetanus germ is blown into the

wound at the time of the explosion. Any injury to the hand under the same circumstances might open the way for tetanus germs to enter.

Horses become infected from the soil, the germ gaining entrance to the body through cuts or deep nail wounds about the feet and ankles. The soil on some farms is so badly infected that one or more cases of tetanus occur every year. Under such conditions farmers often make it a regular practice to give a preventive inoculation of tetanus antitoxin to any animal with skin wounds or cuts.

Cause

Tetanus is caused by a germ native to the soil. This germ forms spores or seeds like the germs of anthrax and blackleg of cattle. They grow in the absence of air or oxygen. Therefore, deep nail wounds of the foot are especially dangerous because the lack of air makes it easier for the germs to grow and multiply. An infected wound that has closed and apparently healed would be ideal surroundings for the lock-jaw organism.

When the tetanus germ enters a wound, it remains at that point and begins to multiply. As it grows, it increases in numbers and gives off a poison or toxin which is absorbed by the blood and carried throughout the body. The difference between the operations of this germ and most of the other common ones should be noted. The tetanus germ stays in the place where it entered the body and distributes its poison from there while other germs enter the body in various ways, gain admission to the circulating blood and are carried everywhere in the animal. This absorbed poison of lock-jaw has a direct action on the nerves, brain and spinal-cord. The toxin secreted by the germ of tetanus is one of the most powerful poisons known to man.

Symptoms

The first noticeable symptom may be stiffness of gait and generally slower movements. The breathing is often

wound at the time of the explosion. Any injury to the hand under the same circumstances might open the way for tetanus germs to enter.

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Symptoms

The first noticeable symptom may be stiffness of gait and generally slower movements. The breathing is often

irregular, with nostrils distended. The animal appears nervous and the face has a strained anxious expression. If the head is lifted quickly, the membrana nictitans or third eyelid is observed to flick over the eye. This symptom alone is considered as positive indication of tetanus.

Noises excite the animal unnaturally. The head is carried straight forward in a stiff awkward pose. In the very acute cases of tetanus, the train of symptoms passes rapidly. The animal may stand in a cold sweat with the front legs spread and braced to help maintain the balance. Muscular spasms follow and sometimes the lips are drawn back, exposing the teeth. This has been described as an agonized grin of despair. The muscles that close the jaws contract and hold the jaws firmly fixed. In some instances the jaws are not locked but show evidence of stiffness.

The tail, quivering slightly, is carried high and stiffly extended. The animal finally becomes very stiff and stands rigidly, its body being shaken at intervals with convulsive spasms of the muscles. The sudden slam of a door may throw the horse into a series of violent muscular contractions. During these spasms the animal is in excruciating pain. During the course of the disease, appetite, bowel movements and urination are often entirely lacking.

Treatment

As soon as the disease is recognized, the animal should be placed in a darkened box-stall or some other outbuilding where it is very quiet and a veterinarian called immediately. If the location of the wound where the germ entered the horse can be located, it could be opened and washed with such an oxidizing agent as potassium permanganate. More often the wound is healed and the owner has no recollection of any injury to the animal. If the animal can eat and swallow, it may be tempted with soft and easily digested foods. If the jaws are tightly locked one should never try to give medicines of any kind. None is of any value in the treatment of this disease. Tetanus anti-toxin is valuable

as a preventive before infection takes place, but is not to be relied on as a curative after the animal is well advanced in the disease. If large doses of the serum are given early, some benefit may be derived. This treatment must be administered by a veterinarian. After any animal shows pronounced symptoms of tetanus its chances of recovery are slight.

CHAPTER VIII

PARASITES OF THE HORSE

HORSES are sometimes infested with skin parasites such as lice, mites, and ticks. Any animal that shows symptoms of itching or rubbing, together with loss of hair or scab formation, should be carefully examined for these parasites. The advice given for the removal of these pests on horses applies also to mules and asses.

LICE

Every kind of animal has its own particular species of lice. The horse louse will not live for any length of time on cattle, sheep, goats, or chickens. Three varieties of lice affect horses, one blood-sucking and two biting, all large enough to be seen readily with the naked eye. The blood-sucking louse is much larger than either of the biting kinds and has a long-pointed head, while the heads of the biting lice are short and blunt. This is natural for the method of attack, for each variety requires different head construction. The blood-sucking lice do the most damage and are also the hardest to eradicate.

All lice lay eggs. The eggs or nits are attached to the hair, close to the skin. After ten to twenty days the eggs hatch and the young lice begin their life, which is spent entirely on the body of the horse. Lice can live only a few days after they leave the body of the animal.

Lice are most troublesome during the winter months, when the hair is longest. In spring and summer the lice appear to desert the horse, but it is probable that a few remain to continue the infestation in the fall.

Symptoms

The sucking louse punctures the skin and sucks blood, while the biting louse lives only on dead hair and scales from the skin. When the lice are active, the irritation is intense, as shown by frequent rubbing against posts, mangers, and fences. The itching is increased when the animal is in a warm place, the warmth evidently stimulating the lice to increased activity. The skin may be bare in patches if the rubbing is long continued. The favorite places for lice to assemble are on the sides of the neck, flanks, and under the jaws. The reason for this is obvious, since the horse cannot easily dislodge them, by scratching, biting, or rubbing.

When horses itch and are thought to be lousy, they should be carefully examined for lice, and when found, treatment should be undertaken immediately. It is necessary to ascertain whether one is dealing with biting or sucking lice, because the treatment varies somewhat for each kind. The difference in size of the mites and the shape of the head will help to distinguish them.

A group of horses usually becomes infested with lice from close association with an animal already infested. Lice are sometimes carried on blankets, brushes, curry-combs, and saddles. When clipping lousy horses, one should be sure to burn the clippings because they harbor the eggs as well as the lice themselves.

When the stable is cleaned after the final treatment, all litter and manure should be removed and sprayed with any coal-tar creosote dip. The proper strength solution is made by following the directions on the label of the container. Since most lice cannot live off the horse more than thirty days, a barn or stable is reasonably free a month after the lousy horses are removed.

Treatment

The best way to eradicate lice is by dipping, but no dip is certain to remove all the lice and kill the nits with one

treatment. Many nits survive the first treatment, hatch, and later reinfest the animals. If dipping is practiced, the animals should be treated twice, fourteen days apart. The best dips are the arsenical solutions, coal-tar creosote, or a nicotine solution. Under usual farm conditions, coal-tar dips will be more convenient. Dipping is done in large vats in which the animals are almost immersed as they swim through. Directions for preparing the dip solution are printed on the label of the creosote can. The disadvantage of the dip method is that it cannot be used in cold weather, this being the time treatment is most needed. Besides this, most farmers in agricultural sections do not have a sufficient number of horses to warrant the construction of a vat for this purpose. Dipping is recognized as the best way to rid any animal of all kinds of lice, but is best and safest when used in the early fall. The arsenical and nicotine solutions can now be purchased from commercial firms through the local drug-store. Dip treatments should be supervised by a veterinarian.

Hand applications may be used in cold weather or when the number of animals is too small to go to the expense of building a vat for dipping. At best, the hand treatments are not a complete success. They will not destroy all the lice, but they improve conditions greatly.

Sodium fluoride will kill the biting lice but is not suitable for the blood-sucking type. Sodium fluoride is a white powder and is very cheap. It may be dusted on the affected animals by hand or with a shaker; do not rub it into the skin and use sparingly about the head. Sodium fluoride may also be applied in liquid form by dissolving 1 ounce of the powder in a gallon of water.

Mineral oil and sulfur are valuable in the eradication of both varieties of lice. The solution is made by stirring enough flowers of sulfur into a quart of mineral oil to give it a thick soupy appearance; apply with a brush or cloth. This treatment is effective but will mat the hair.

The coal-tar creosote solution may also be used in the form of a spray. An ordinary garden or hand-sprayer will do the work well. This is a warm-weather treatment.

MANGE MITES

Mange in horses is usually called scabies, itch, or scab. This disease is caused by one of three varieties of mites; namely, the sarcoptic, psoroptic, or chorioptic. The sarcoptic mite is the most common and also the most dangerous. Each variety of mite has its own particular habits, but all affect the skin of infested animals similarly.

Whenever mange is suspected, it is good practice to take scrapings from the skin in the affected areas and have them examined under the microscope to find out which variety of mite is causing the trouble. The local veterinarian or state college of agriculture is equipped to make such an examination. When taking the scrapings one must be sure to scrape deeply until the blood comes, since the sarcoptic mite digs under the skin and may be missed. Most of the mites can be seen with the naked eye when placed against a dark background, but the microscope is needed to distinguish between the different species.

Sarcoptic mange

The sarcoptic mite burrows into the outer layers of the skin and lives in tunnel-like galleries. Here the eggs are laid and hatched. It is possible for a new generation of mites to be produced every fifteen days, the entire life of the mite being passed on the animal. Because sarcoptic mites multiply rapidly and live under the outer layers of the skin, it is extremely difficult to eradicate them.

This form of mange can be readily transmitted to other animals and man. All horses suffering from this disease should, therefore, be kept apart from healthy animals. In many states there are strict quarantine regulations against this disease. An animal in poor condition is especially

susceptible and the disease would spread rapidly over the entire body. Mites may live a month or longer off the animal's body. The stables or other quarters occupied by many horses should be carefully cleaned and disinfected with a coal-tar creosote solution.

Mange is probably introduced into a healthy herd by the addition of an animal already infested. The disease usually begins on the skin of the neck, shoulders and head, but afterward may reach any part of the body. The digging operations of this mite cause so great an irritation of the skin that the animal rubs and scratches itself incessantly until the skin becomes inflamed, sore, and tiny abscesses appear. These little abscesses or pustules break open as the animal scratches or rubs, causing the formation of raw sores and scabs. The hair falls out and the skin has a wrinkled leather-like appearance. If an animal has been affected for a long time, great patches of skin may be entirely without hair.

Sarcoptic mange is very troublesome. The treatment is time-consuming and requires patience. The lime-sulfur, nicotine, and coal-tar dips, described for mange in cattle, will kill these mites, but it takes several dippings, a week apart, to penetrate the skin sufficiently to kill all the mites. The dip treatment will not be popular on a farm unless large numbers of animals are to be treated.

Two or three hand applications of crude petroleum may be used in the early stages of the disease. This treatment may blister the skin, but it is very helpful for the winter control of mange when dipping is out of the question. Crankcase oil has been used, but this also blisters and causes loss of hair.

The sulfur and mineral oil described for the treatment for lice may be used with reasonable assurance of success. It should be kept in mind that any method of treatment must be started early in the course of the disease for the best results. If badly infested, most treatments are likely to be a failure and the animal must be considered incurable.

Psoroptic mange

Psoroptic mange is not so prevalent as the sarcoptic type and is not nearly as dangerous or difficult to eradicate. The psoroptic mite is somewhat larger than the sarcoptic. These mites also hatch out from nits and spend their entire life on the horse. The fact that mites lay eggs complicates any treatment, because a second or third application is often necessary to kill the mites that hatch out from nits after the first treatment. The psoroptic mite does not burrow under the skin.

This species of mange mite lives only on members of the horse family and is considered more contagious than the sarcoptic. It is carried or transmitted in much the same way as sarcoptic mange, in stables, blankets, harness, and barn utensils.

Psoroptic mange appears first about the head, mane, and rump, spreading from these places over the entire body. The mites irritate the skin and the animal scratches, rubs, and bites the skin to secure relief from the intense itching. The skin becomes inflamed, reddened, moist and scabby. As the disease progresses, the skin may be wrinkled, leathery, and bare. A microscopic examination of scrapings from the skin is necessary to distinguish this type of mange from the sarcoptic variety.

This mite is easier to eradicate than the sarcoptic, because it lives only on the surface of the skin. Dipping is recommended when the number of affected animals is large enough to warrant the expense and labor involved. Two dippings should be used ten to twelve days apart.

The same hand treatment advocated for the removal of the sarcoptic mite will destroy these. Unprocessed crude petroleum is especially favored, but considerable care must be used in its application to prevent unnecessary blistering.

Chorioptic mange

Chorioptic mange is also called foot mange. It is caused by another species of mite resembling the psoroptic. This

mite also lives on the surface of the skin. Chorioptic mange is contagious in the same way as the other two forms. The disease is confined to the skin about the feet and ankles, but may occasionally reach the upper parts of the legs and belly.

The same symptoms of itching with kicking, biting, and rubbing of the affected parts are observed when this parasite is present. The skin has the same scabby appearance as in the other types of mange. The location of this disease on the feet and legs would serve to distinguish it, but a microscopical examination of skin scrapings would be necessary to identify the species of mite.

The coal-tar solution, made according to the directions on the label of the container, is effective for the hand treatment of the feet and legs. The treatment should be repeated at twelve-day intervals until recovery is assured. Unprocessed crude petroleum and the sulfur and mineral oil mixture are also valuable. Both of these may be applied by hand with a brush or rag.

THE SPINOSE EAR-TICK

The spinose ear-tick of horses is generally unknown, except in the South and Southwest. In this section it may cause considerable trouble.

The ear-tick of horses has a life history similar to that of the Texas fever tick affecting cattle. The young six-legged seed ticks crawl deeply into the ear, establish themselves, suck blood, and in about two weeks become engorged larvæ. After this they go through a molting stage and develop into eight-legged ticks. The ticks remain in the ear for several months until they acquire their full growth, during which time they become swollen with blood. They finally crawl out of the ear and drop to the ground.

The young tick is about as large as a bedbug and has minute spines on its back, while the adult is smooth-backed and about the size of a small split bean. After the adult

ticks reach the ground, they mate and the females lay eggs which hatch out in about ten days, if the weather is favorable.

Symptoms

When the ticks are numerous they may be seen with the naked eye on casual examination of the ear, but if the number is small it may require a much more careful search to find them. When large numbers of ticks inhabit the ear, the inner cavity may be filled with accumulated wax and scales to such an extent as to interfere with hearing. The animal shakes its head from side to side and may try to relieve the itching by rubbing the ears. Any horse showing these symptoms should be examined carefully.

Treatment

The Bureau of Animal Industry has perfected a treatment for the eradication of ear-ticks, consisting of a mixture of 2 parts by volume of ordinary pine-tar and 1 part by volume of cottonseed-oil. These ingredients will mix readily if both are warmed.

Horses do not like to have the ears examined or treated and make considerable fuss when either is done. When treatment is undertaken, the animal must be restrained either by putting a twitch on the nose or some other simple means devised by the owner. A metal or hard rubber syringe should be used for injecting the pine-tar mixture into the ear cavity. If the mixture is heated before use, it will flow readily from the syringe into the inner recesses of the ear. Inject the oil as far in as possible and turn the animal's head to one side to permit it to run in farther. Introduce $\frac{1}{2}$ ounce of the mixture into each ear. If the ear is filled with wax, it will be necessary to scrape this out before treatment is begun. One treatment will destroy all the ticks present at the time, but infestation by another crop of small seed ticks may occur in a month or two.

INTESTINAL WORMS

While horses are sometimes infested with worms, they suffer very little in comparison with sheep, swine, or chickens. Round-worms may infest colts and old horses in large numbers and at times cause death. Generally speaking, worms are not considered a serious menace to horse-raising. On some farms worms may cause the loss of one or two colts, but the farmer need not concern himself greatly because the habits and living conditions of most horses are such that great losses are unlikely, even though infestation does occasionally occur. Many horses tolerate a few worms without showing any ill effects and do not require treatment.

Tape-worms in the horse will not be discussed because they are unimportant. The round-worms, which include several varieties, comprise the group more often encountered on the farm.

Ascarids or common round-worms

These are the biggest worms that commonly infest the horse. They are round with pointed ends, yellowish-white in color and are sometimes as big around as a lead-pencil. They vary in length from a few inches to a foot and when examined have a stiff or starched feeling. These worms are very seldom overlooked on account of their size, and the owner may notice the worms in the manure. They live in the intestines and do little damage unless great numbers are present. The animal may show no evidence of infestation beyond the passage of one or two worms at intervals. Young colts are more susceptible to heavy infestation and the worms may be present in sufficient numbers to give rise to symptoms of pain or colic.

The discovery of this type of worm in the manure would indicate their presence. Horses badly infested might show a run-down appearance, not indicative of any special disease. In some animals, colts in particular, there may be colic and the general symptoms of a simple case of indigestion. If there is a very large mass of the worms in the

stomach or intestines, the colt may roll, kick, and occasionally have convulsions. In some cases the colt may die and the cause is not discovered until the post-mortem examination reveals enormous numbers of these worms matted together in the stomach or intestines. Unthriftiness without fever, uneven appetite, irregular bowel movements and possible colic might lead a farmer to suspect worms. The kind causing the trouble would need to be determined by finding some in the manure or by a microscopic examination of the manure to discover worm eggs. Each species of worm has its own characteristic egg.

The best treatment for the eradication of the large round-worm is the use of oil of turpentine, carbon bisulfide or tartar emetic. All are poisons and must be administered with great caution. Oil of turpentine is usually given in 2-ounce doses mixed with a quart of raw linseed-oil. The amount of turpentine would vary slightly for a very young animal. An owner should never attempt treatment of horses with any of these drugs, except when veterinary service is unavailable. The treatment is accompanied by danger and when administered by one unaccustomed to drenching a horse, death frequently follows. When treatment is attempted, the safest would be the turpentine and raw linseed-oil given from a long-necked bottle. Raise the head slightly and allow the oil and turpentine mixture to run into the mouth slowly. Do not hurry the animal, because the liquid may run into the wind-pipe and produce a fatal pneumonia. This has happened many times.

Strongilidæ

These worms constitute a family which lives in the small intestines of horses. There are many species. A horse may suffer from infestation with any one. In general, these worms are straight and range in color from gray to brown or red, depending on the amount of blood they have sucked from the horse. They vary in length from very tiny to 2 inches.

When large numbers of the adult worms are present in the small intestines of horses, considerable damage is done. The larvæ, immature or baby worms, often do more harm than the adults. The immature or young worms of some of the species bore into the blood-vessels in the lining wall of the intestines and travel to some of the large arteries or blood-vessels, where aneurisms or dilations occur in the walls. These bulges in the blood-vessels interfere with the circulation of blood and may even rupture and cause the death of the animal. Other species of larvæ or young worms have been found in other parts of the animal body, but eventually all the larvæ find their way back to the small intestines where they develop into the adult worm.

The horse usually becomes infected in the spring and the first symptoms of a serious nature may not be observed until autumn. There may be diarrhea, lack of appetite, and gradual loss of flesh. There is likely to be some evidence of anemia, since these worms are blood-suckers. It would be difficult to determine this kind of worm infestation from the symptoms alone, because all wormy horses show essentially the same outward signs. The discovery of adult worms about 2 inches long in the manure would assist in the proper diagnosis. If these red match-shaped worms are seen together with the symptoms mentioned, a reasonably safe guess might be made.

It is impossible to treat the larval form. The adult worms may be removed with carbon bisulfide and oil of chenopodium when administered in proper doses by a veterinarian. These drugs are too dangerous to be placed in the hands of inexperienced persons. When the owner wishes to attempt treatment himself, oil of turpentine may be used in 2-ounce doses, mixed with a quart of raw linseed-oil. Boiled linseed-oil is poisonous and should be avoided. The oil of turpentine mixture may be given from a bottle as a drench, by raising head slightly and allowing the oil to run slowly into the mouth. Death would follow if the animal should choke and the oil find its way into the lungs.

When several animals are infested with these worms, an examination of the water supply should be made for the possible source of infection.

Oxyuris or pin-worm

This worm is common in horses. It is usually white in color, about 2 inches long, and possesses a pointed tail (Fig. 7). It differs from the two worms just described in

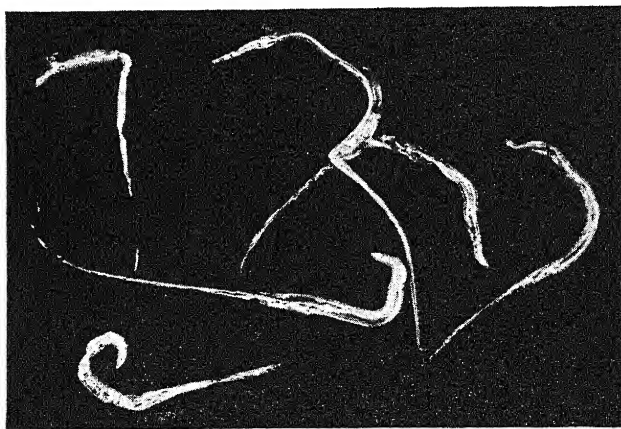


FIG. 7.—*Oxyuris* or common pin-worm of horses. The thin pointed tails will aid in identification. These worms are life size.

living only in the large intestine of the horse. These worms do little harm, but seem to annoy the animal considerably. The affected horse is often unsightly and its "tail switching" and "line hugging" tactics serve to worry the driver.

As stated, the adult pin-worm lives in the lower bowel, but when the females are ready to lay eggs they proceed to the end of the rectum or anus and deposit them. These masses of eggs appear as a greenish-yellow or white crust under the tail and cause itching, rubbing, and loss of hair in this region, the animal stopping to scratch the hind quarters at

every opportunity. Infestation with the pin-worm is easily recognized by finding the adults sticking out of the anus and also by the crust formation under the tail.

Usually the eradication of pin-worms is easily accomplished by means of rectal injections or enemas. Secure a 6-foot length of rubber tubing and a funnel or an ordinary household fountain syringe outfit. Prepare a pail of warm soapy water. Insert the rubber tubing about 2 feet into the rectum and with the aid of an assistant give an enema of the soapy water to wash out the bowel. When this is entirely emptied, prepare the following solution, it being quite efficient in expelling the worms. Mix $1\frac{1}{2}$ ounces of creolin or lysol in a gallon of water. Inject this into the lower bowel, through the rectum, in the same manner as the soap solution. This treatment can be repeated at intervals if necessary. To relieve the itching about the anus, use mercurial ointment. Secure this from the drug-store and smear it about the affected skin around the anal opening.

BOTS IN THE STOMACH

Almost all farmers are familiar with the larval form of the bot-fly, which is present in the stomach of most horses. These larvæ, as a rule, do no serious damage and a horse seldom shows any ill effects, even though the numbers of grubs or larvæ in the stomach are very great. There are, no doubt, some instances in which death has occurred, but these are not numerous.

Cause of bots

Bots in the stomach and upper intestines of horses are caused by the activities of bot-flies. There are three distinct species, but the one universally distributed is the common bot-fly or nit-fly. It deposits its eggs chiefly on the hair of the legs.

The second species is known as the chin or throat bot-fly and is frequent in the Rocky Mountain section, but is

rapidly spreading to other regions. This fly annoys the horse more than the first, because it strikes about the head and deposits its eggs on the hair of the chin and throat.

The third species is the nose bot-fly. It is found chiefly in the north central part of the United States, but probably will spread over the entire country in time. This fly fixes its eggs to the skin about the nose.

None of these flies bites, but causes the animal great annoyance when it strikes or deposits its eggs. All three species are especially active on bright sunny days. When large numbers are present, they worry the horses incessantly, causing them to gallop wildly about a pasture. Sometimes animals will huddle together in the shade, with their chins resting on one another's back, trying to protect their noses and throats from the attacks of the flies. Horses in harness may start suddenly and run away. Bot-flies are common from June until late in the fall. These flies do not appear to feed at all, their life purpose being reproduction only.

How the bots reach the stomach

The eggs of all three species are cemented to the hairs about the legs, throat and skin of the lips. They hatch in a few weeks and the young bots are licked off by the animal, swallowed, and carried into the stomach, where they attach themselves to the lining by means of hooks (Fig. 8). Here, in the bot or maggot stage, they spend eight to twelve months. Their color at this time ranges from red to yellow or a dirty white.

After spending the greater part of their life inside the stomach of the horse, the bots pass to the ground with the manure. They burrow into the soil and remain from three to ten weeks, during which time they develop further, until they finally burst out of their shells and emerge as adult flies. From this point on they have only twenty-one days to live, their entire life cycle requiring about a year.

Most of the bots will have been passed from the stomach

by October or November, and many of those reaching the ground after this time probably perish from freezing.

How to prevent attacks of bot-flies

A good fly repellent is made from equal parts of pine-tar and lard. This is smeared on the skin and hair about

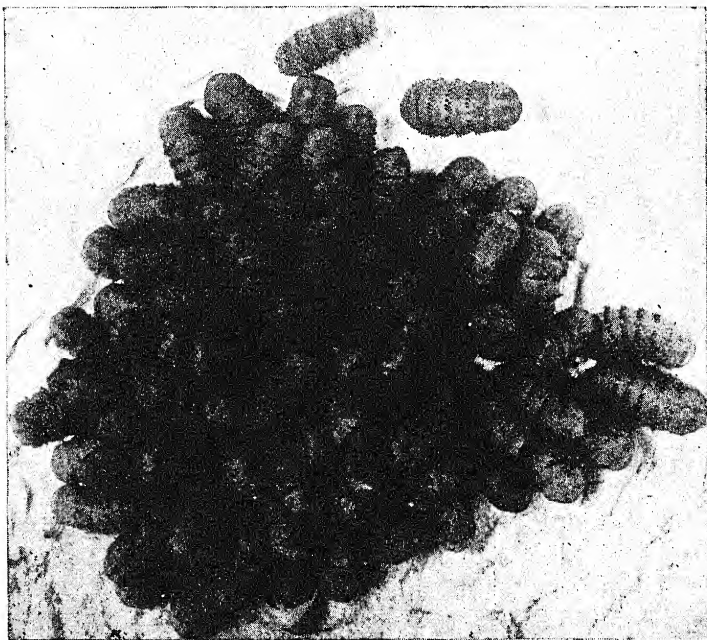


FIG. 8.—Portion of inside of the stomach of a horse, showing bots attached to the lining.

the nose, throat and legs. It will keep flies away for three or four days. This might be helpful to protect horses in harness.

A piece of webbed belting, burlap or carpet suspended under and close to the skin of the nose has been used with fair success to ward off the attacks of nose flies. A square

CHAPTER IX

DISEASES OF THE SKIN, LEGS, AND FEET

THE diseases discussed in this chapter are of a non-contagious nature and make up one of the most important groups with which a farmer must contend. During the summer months many animals develop sores from ill-fitting collars and saddles, together with many infections and injuries of the feet and ankles. These are always extremely troublesome and a source of concern. Melanosis will be described at this time; while not a disease primarily of the skin, the black swellings in the skin of a gray or white horse are the most noticeable symptom. The description of bone deformities is given more for their recognition than for treatment.

URTICARIA OR NETTLE-RASH

Urticaria, a disease of the skin, begins suddenly, and usually takes the form of welt-like swellings, varying in size from a pea to a hickory-nut, which when numerous may appear to run together. The swellings consist of a thickening of the skin with no tendency to blister formation or discharge of pus. The skin of any part of the body may be affected and, if the disease becomes general, the eyes, nose, lips and throat may become involved. The swellings appear without warning, persist a few hours, and disappear as quickly as they came. However, at times the swellings may last for a week.

The exact cause of urticaria is unknown although nettle leaves have been blamed, this accounting for the common name. Urticaria is frequently associated with bad weather

conditions, lack of sufficient exercise, abrupt changes in feed, and sluggishness of the bowels. Any of these conditions might cause the trouble, but nothing certain is known.

Most affected animals recover without treatment of any kind. If the swellings persist, 1 pound of Glaubers salts might be given in a drench. A bran mash is helpful to promote free bowel movements and, if necessary, the swollen skin may be bathed with a mild solution of vinegar or alum.

HARNESS SORES OR GALLS

During the winter months horses are usually resting from hard labor and often become soft and out of condition when



Fig. 9.—Collar or shoulder sore resulting from heavy work in a poorly fitted collar.

the rush of spring work comes. Animals then put in long hours, even from daylight until dusk. They perspire freely and this, together with the chafing of a poorly fitted collar, irritates the skin until the hair is rubbed off and a raw sore is left (Fig. 9). The sore may become infected with

the formation of an ulcer. Sores of this kind may occur with a perfect-fitting harness, but they would be aggravated further by an ill-fitting one. An animal showing a tendency to lay back in the collar and shirk its share of the load should be examined for shoulder sores.

Saddle sores are caused by uneven pressure of some part of the saddle and may be on top of the backbone or on either side of the middle line. Girth sores are occasional on the sides just back of the elbows.

When the affected skin in either a collar sore or a saddle gall becomes hard and leather-like, with pus formation underneath, it is frequently referred to as a sitfast, because it is hard to remove.

Many collar sores might be avoided if the horses were broken in to hard work gradually. One should be sure the collars are well fitted and of the proper size, because one too large is as bad as one too small. Collars and saddles should be cleaned occasionally to remove the caked sweat and dirt.

A saddle should fit the back snugly and evenly, with no direct pressure on the backbone. A clean saddle blanket should be provided when one becomes very dirty and ill-smelling. One must be careful that no folds of the skin are turned in under the girth.

Treatment

A few days rest, together with bathing of the sore shoulder or back, will often cure many cases when only a small patch of the skin is affected. Any good dusting powder secured from the drug-store will assist healing. If the affected part is large and ulcerated, rest for the animal is imperative. Clip the hair about the edges of the sore and bathe it with a warm water to remove dust and dirt. Prepare a solution made of either sugar of lead or zinc sulfate, at the rate of 20 grains of either to an ounce of water. This can be prepared by any druggist and should be applied daily. Iodoform powder as a dressing is also effective in

the treatment of the raw sores. A sitfast must be removed surgically by a veterinarian. Rest with cleanliness and the application of ordinary antiseptics will usually cure collar or saddle sore.

SCRATCHES OR GREASE

Several terms are applied to this disease of the ankles and legs of horses, among which might be enumerated scratches, grease, grease heel, cracked heels and mud fever. Regardless of name, the condition remains the same and for the sake of clearness the name grease will be used here.

Grease is an inflammation of the skin accompanied by itching, cracking, discharge, and in chronic cases the formation of wart-like growths, which are often called "grapes." A foul odor is usually observed with these changes.

Cause

Some writers state that grease is an infectious disease and even describe the finding of specific germs. Germs are present in the affected skin but probably they are only an accompaniment and not the actual cause.

Over-feeding, faulty nutrition, and sluggishness of the bowels are given as factors assisting the occurrence of grease, but the real initial cause in most cases is poor sanitary conditions, when an animal is obliged to stand in accumulations of manure and urine, working in wet soil in the spring of the year, and at times when heavily feathered horses receive little or no grooming. This causes the hair to become matted with mud, urine and manure. Stated briefly, grease is initiated and aggravated by moisture, mud and lack of care.

Symptoms

The early stages of this disease are not usually noticed because the inflammation, as shown by reddening of the skin, is covered by hair. If examined, the skin will be found to be red, swollen, very sensitive to the touch, and itchy. If

nothing is done to relieve the animal and the cause continues to be present, the skin breaks, cracks crosswise, and discharges a gummy liquid which has a very foul odor. From this stage the area of skin affected may extend down to the heel or upward to the hock. When the disease is permitted to take its course untreated, the condition frequently becomes chronic, resulting in the formation of the wart-like growths at the ankle. The animal is stiff and lame in succession. Grease affects the hind legs most, but may occur on all four legs.

Treatment

Whatever the cause may be, it must be removed. If possible, the animal should not be worked during treatment. First clip the hair away from the affected parts of the leg and wash thoroughly with warm water and soap. Scrape off all accumulations of manure and caked mud. Following this, dry the leg with cloths and bathe it carefully with a solution made of 2 drams of sugar of lead in a quart of water. This treatment should be repeated daily. Bandages may be applied to keep out dirt and litter. The horse should be kept in a stall well bedded with clean dry straw, or run in a pasture that contains no mud or water holes.

Vaseline and other greasy substances are of no value and serve only to collect dust and dirt. If the animal must be worked, no treatment is likely to be satisfactory. Sometimes a surgical operation is necessary to remove the grape-like warts.

FISTULOUS WITHERS AND POLL-EVIL

The term fistula means a passage or opening through the skin, leading to an abscess in the deeper layers of flesh or muscle underneath. When the fistula is located near the withers, the name fistulous withers is used, but when the discharge of pus appears at the back of the head, it is called poll-evil. The opening in the skin either at the withers or

the poll is merely the outlet for pus from abscessed tissue located at some distance from the opening and connected by a canal or fistula, through which the pus flows to the surface.

Cause

A fistula of the withers or poll is usually caused by bruises or injuries of some sort. Poll-evil might be brought on by the irritation of poorly fitted bridles or a blow on the back of the head from a beam, low doorway, or the butt of a whip or club. The original injury to the withers may have been caused by the chafing of an ill-fitting collar, a saddle placed too far forward, or by actual blows. In both poll-evil and fistulous withers the initial injury may have been a bruise which became infected, and the resulting abscess, instead of draining outward, first works down underneath into the heavily muscled part of the neck. This forms the canal or fistula and soon large amounts of pus accumulate in deep pockets in the muscles of the neck. When the inner reservoirs become filled with pus, the overflow escapes through the canal or fistula and passes out through the opening at the withers or poll.

Symptoms

The first indication of trouble is shown by sensitiveness in the region of the neck or poll. The animal may be jumpy and fight when the bridle or collar is adjusted, and soon a gentle animal develops exceedingly bad stable manners. Later, a distinct swelling may be noticed at the place affected. This is hot and painful and soon the swelling ruptures and pus is liberated. The discharge of pus is the first positive indication of a serious condition. The opening in the skin may appear to heal when some salve is used, but it soon breaks out again, discharges pus for awhile and closes again. Sometimes there may be more than one opening and one or two of these may discharge pus continuously.

Treatment

It is useless for farmers to attempt treatment of a fistula of the withers or poll. There are many reputed cures for the disease, but all are worthless. The application of a salve to the outer skin is useless to relieve a deep-seated infection. Sometimes poultices and blisters are advocated for relief, but they have been found of no value.

The only treatment that has any hope of success is surgical. The animal should be taken to a veterinary hospital where an operation may be performed for the removal of the diseased tissue in the neck or shoulder. The after-care required is long and tedious, frequently requiring several months for a complete cure. If the affected animal is not of great value, one should hesitate before going to the expense and inconvenience of the operation.

QUITTOR

Quittor is a disease very much like fistulous withers and poll-evil, but the infection is located in the foot. The cause is also the same, being usually due to an injury of some kind followed by infection and pus formation. Quittor affects the inner structures of the foot, involving both cartilage and bone. This disease is found most in the front feet but may affect all four. Any wound of the coronet or top of the hoof may lead to quittor.

The first symptom noticed is a hot sensitive swelling of the coronet at the top of the hoof. The animal favors the foot and may even refuse to bear any weight on it. After a few days the swelling may come to a head and rupture, discharging pus much like poll-evil. This may continue for some time until the opening heals, only to break out later. There may be more than one opening discharging pus at this place. The infection and diseased tissue is inside of the hoof wall, but the pus finds its way to the surface through a canal or fistula.

After quittor becomes well established, it is one of the most difficult diseases to treat satisfactorily. When taken

early, some recommend the injection of an antiseptic solution into the abscess opening, hoping to reach the seat of the diseased tissue. As a rule, home treatments are not a success, because the knife and probe must be used extensively. A disease of this nature requires the best help available, and even then may not turn out favorably.

WOUNDS

Skin or flesh wounds in farm horses are not always taken seriously and no particular effort is made to keep them clean and free from infection. Cleanliness is absolutely essential to rapid healing of any open wound. Then, also, the use of antiseptics is much misunderstood, many thinking that the stronger the antiseptic solution the more likelihood of killing all the germs in the wound. If an antiseptic solution is too strong, actual damage may be done by the destruction of the tissues themselves as well as the germs. The best practice to follow in making up any antiseptic or disinfectant solution is to follow the directions on the label of the container. One should not mix an unknown quantity of dip or other disinfectant into any given amount of water and hope that it is right. It is just as easy to have it the proper strength.

There are several kinds of wounds; namely, cuts, punctures, lacerated or torn wounds, and bruises. Any of these wounds may become infected, discharge pus, and at times cause a general blood-poisoning. This, of course, happens more often in man than in animals.

Cut wounds

Simple cut wounds of the skin may be more serious than at first suspected. They are usually caused by some sharp-edged instrument and heal readily if kept clean and free from dust and dirt. Skin cuts may be washed with almost any warm antiseptic solution and, if located in favorable places, a cotton pack and bandage may be applied for protection.

Deep slashing cuts that involve the heavily muscled parts of the body will require the same general care as to cleansing and antiseptic washes, but bandaging is usually impossible and also undesirable. If the wound is long, deep and gaping, expert aid will be needed to clean the inner recesses and possibly sew the edges together. The rule for cut wounds of all kinds is to clean and keep them clean. Healing will take place quickly by direct union of the cut edges with the formation of a slight scar. If infection is permitted to enter the wound through lack of care, the healing will not be the same and recovery may be greatly delayed.

Punctured wounds

Deep punctured wounds are always dangerous and are easily overlooked, often resulting in deep-seated infections which are very difficult to treat successfully. Punctured wounds are favorite avenues for tetanus or lock-jaw germs to enter the body. Following a deep puncture wound in the foot, inflammation may begin with a swelling which is kept in bounds by the hoof wall, causing great pain and pronounced lameness. In all such cases the help of a veterinarian should be sought, because the treatment requires the use of a knife and a thorough knowledge of the structure of the foot. Any punctured wound of the feet should be considered dangerous until proved to the contrary.

Torn or lacerated wounds

Badly torn or lacerated wounds are accompanied by bleeding and are painful, because of the tearing of the blood-vessels and nerves. Infection frequently follows in wounds of this nature and pus formation is usual. Lacerated wounds may be caused by running into barbed-wire fences, kicks by a stable mate, falls, and many other accidents. The torn wounds have ragged edges, with raw and ugly bleeding surfaces.

Lacerated wounds should first be examined carefully to remove all outside matter, such as dirt, imbedded hair,

gravel or slivers. If the bleeding is excessive, cold water may be thrown on the wound or a stream of water from a hose, if one is available. After this the wound should be washed with any mild antiseptic solution. If the bleeding still persists, a layer of absorbent cotton may be placed over the wound to hasten coagulation or clotting of the blood.

Most torn wounds of this type become infected and discharge pus. On this account, sewing the wound is not practiced, as it might interfere with the free drainage of pus. Pus is not to be worried about, because most wounds of this character discharge what is commonly spoken of as "healthy pus." It is a creamy-yellow color and odorless. The "unhealthy" kind of pus is thick, blood-stained, and has a foul odor.

The best treatment is to keep the wound clean with frequent antiseptic washes and permit free drainage of pus. If the wound is high up on the animal, the pus may not drain out easily and may form pockets which burrow into the tissues. When this happens, a veterinarian will be necessary to operate and provide a new opening lower down for the pus to drain through. Wounds of this nature usually leave ugly scars.

Bruises

Bruises are wounds without a break in the skin, but the flesh underneath may be injured and bleed profusely, sometimes causing the formation of great blood-blisters. Any bruise is followed by a swelling which may be either slight or extensive, depending on the nature of the injury. The common causes of bruises are colliding with blunt objects, falls, kicks, and blows.

Small bruises are often left untreated and recover without any serious complications. Hot or cold packs or applications may be used to relieve the pain and aid in reducing the swelling if it is a simple bruise of the skin and underlying muscle. If the swelling is large, puffed, and appears

to contain pus, blood, or other liquid, this must be opened or lanced to permit drainage. A long opening should be made at the lowest part of the swelling, flushed with an antiseptic solution and further drainage permitted.

THRUSH

Thrush is a disease affecting the frog of the foot. It is probably an inflammation of the glands contained in the frog. Thrush is seen chiefly in the heavy draft horses of the cities, but may occur anywhere when conditions are favorable. Dampness, insanitary stables, and improper paring of the frog when shoes are applied are thought to be causes. Thrush affects the hind feet most, but no reason can be given for this.

The principal symptom is an especially offensive odor, the frog being soft with a sticky discharge oozing from the cleft. This softens the horny part of the frog and adds to the foul odor. When the frog is almost destroyed, lameness may result. The offensive odor and soft moist frog are sure indications of thrush.

All the diseased or softened part of the frog should be pared away until the healthy tissues are reached. Then wash the foot with a mild antiseptic solution. Dry the bottom part of the hoof, after which a piece of oakum or absorbent cotton soaked in pine-tar is placed against the affected part of the frog. This may be kept in position at least for a few hours by bandaging the foot with a clean bran sack. Place the animal in a clean stall and provide plenty of dry bedding. A day or two later the foot should be dressed again in the same manner. Dry quarters and cleanliness will bring about a cure.

FOUNDER OR LAMINITIS

The structure of a horse's foot is much more complicated than that of man. The wall of the hoof incloses an unusually large number of nerves and blood-vessels, making injuries

or infections of the feet extremely painful and difficult to treat. Founder is an inflammation of the inner sensitive laminae or leaf-like tissues of the foot and is not usually accompanied by infection or pus formation. The inflamed inner foot swells and, since the horny wall is hard and unyielding, expansion is impossible, causing great pain. This condition might be compared to the wearing of a shoe one or two sizes too small, with the resulting discomfort. Founder affects the front feet most, but may occur in the hind feet and rarely all four become involved.

The exact cause of this disease is unknown and, as a result, innumerable opinions are expressed. Among these might be mentioned, long periods of rest with little or no exercise, over-heating followed by chilling, exposure to cold wet weather, heavy grain feeding after semi-starvation, neglected or faulty shoeing, and over-work. Founder may follow such diseases as purpura, inflammations of the udder, and after foaling especially when some difficulties have been encountered. Probably, neglected feet accompanied by over-feeding of heavy idle horses would account for a large number of cases. Founder may be acute, lasting only a few days, or it may be chronic and persist for a long time.

Symptoms

The disease appears suddenly, the animal standing quite still and refusing to budge even though urged. When force is used the horse may take a step or two, groan, and settle back into the same awkward position. If the horse is lying down, it is almost impossible to make it stand, because the feet hurt badly. The expression of the face is one of pain and when movements are forced the animal may tremble from sheer agony.

The feet are affected in pairs. When the front feet only are diseased, they are carried well forward with the hind feet drawn under the body to support most of the weight.

If the animal is turned around it may appear to pivot on the hind legs, favoring the sore feet as much as possible. When only the hind feet are involved, they are placed forward with the weight on the heels and the front feet are drawn as far back as possible to reverse the load, giving the animal a characteristic bunched-up appearance. When all four feet are included, the animal stands stiffly and will refuse to move. All animals with founder have a fever, breathe rapidly, and the feet feel hot to the touch. Chronic founder may be a continuation of the acute type just described and the symptoms are not so pronounced or striking. The long-continued inflammation of the foot results in an altered appearance of the hoof. The toes grow longer from disuse, the heel recedes or shortens, and the hoof wall has a parallel ringed, wavy or uneven, surface. These changes generally cause lameness.

Treatment

Proper handling of this disease will require the services of a veterinarian trained in the use of medicine. The owner, however, may relieve the animal until help arrives. First, the shoes should be removed; this will reduce the pressure on the wall of the hoof, especially if the animal is improperly shod. To allay the pain as much as possible the feet should be packed in ice, using a burlap bag for a binder, or placed in tubs or pails of ice-cold water. If running water is available, a stream of cold water applied to the legs and feet affords relief. Treatment should be kept up continuously for three or four hours. When the veterinarian arrives he will administer a quick-acting physic and outline further treatment.

LYMPHANGITIS OR BIG-LEG

This disease is primarily one of the horse, but a similar condition has been observed in some other domestic animals. It is a severe inflammation of the lymphatic vessels of the leg, resulting in a pronounced swelling, from which

the term big-leg is derived. While the disease may affect any one or all four legs, it is usually seen in one or other of the hind legs. Heavy horses are most susceptible.

Big-leg has been attributed to a variety of causes, among which are mentioned sluggish disposition, over-feeding with high protein feeds, especially after a long stay on pasture, and following heavy duty after a period of comparative inactivity. In opposition to this, many believe that big-leg is caused by an infection of some kind through a skin wound or nail puncture.

Symptoms

Lymphangitis is ushered in by uneasiness, shivering, sweating, fever, rapid pulse, and faster breathing. The animal assumes a depressed attitude and may refuse food. Lameness follows in one or both of the hind legs, together with swelling. The leg feels hot to the touch and is very sensitive. The leg continues to increase in size, the swelling finally spreading up to the hock and down to the foot. When the animal is disturbed, the leg is held gingerly or is placed lightly on the ground.

The disease develops quickly over night and the owner is seldom aware of it until the swelling and lameness are noticed in the morning. As the disease progresses, the swelling takes on a doughy consistency, pits on pressure of the thumb, and after a time becomes less painful. The horse is constipated and small amounts of urine are passed. If treatment is begun promptly, the swelling will go down after three or four days, although the lameness may persist a few days longer. The leg is frequently permanently increased in size, leaving the animal subject to another attack.

Treatment

If possible, the horse should be placed in a well-bedded box-stall. Plenty of water is needed to allay the thirst accompanying this disease. A quick-acting physic should

be administered by a veterinarian. As first-aid treatment the owner may apply heat to the legs by soaking a blanket or large bath towel in a tub of hot water and, after being wrung out, this may be wrapped about the legs. After the hot-water treatment, the leg should be dried and rubbed with any good liniment. It is also recommended that 2 to 4 ounces of Carlsbad salts be given three times a day. Complete rest and careful feeding of bran mash or other easily digested feeds will usually affect a cure in a week or ten days. When recovery takes place, the animal should be introduced to light work very slowly and for short periods.

MELANOSIS OR BLACK TUMORS

Black tumors of the skin are common in gray or white horses. The tumors are found in the dark- or black-skinned parts of the horse, namely, about the root of the tail, anus, vulva, sheath, udder, eyelids and lips.

The formation of these black tumors is a cancerous condition due to the deposit of large amounts of black body pigment or melanin in the affected parts. Frequently these tumors are widely distributed among the internal organs as well, and may be the cause of death. When cut with a knife, the tumor is found to be solid black throughout the mass.

Little is known as to the exact cause, but the black color is derived from the natural pigment that colors the hair and other black parts of the body. Since the tumors are found only in gray or white horses, it is suggested that the black pigment-forming cells may run wild, and instead of producing only the amount of pigment necessary to color certain parts of the body, enormous quantities are manufactured and deposited as black tumor-like swellings in various places. The disease is not contagious.

Treatment is useless and seldom attempted. Some owners apply salves and ointments but they do no good. When one or two such tumors disfigure a valuable animal, they may be removed by a surgical operation.

DEFORMITIES OF THE LEGS AND FEET

The legs and feet of horses carry great weight and are subject to continual stress, strains, bruises, and other injuries. In addition to bearing its own weight and pulling

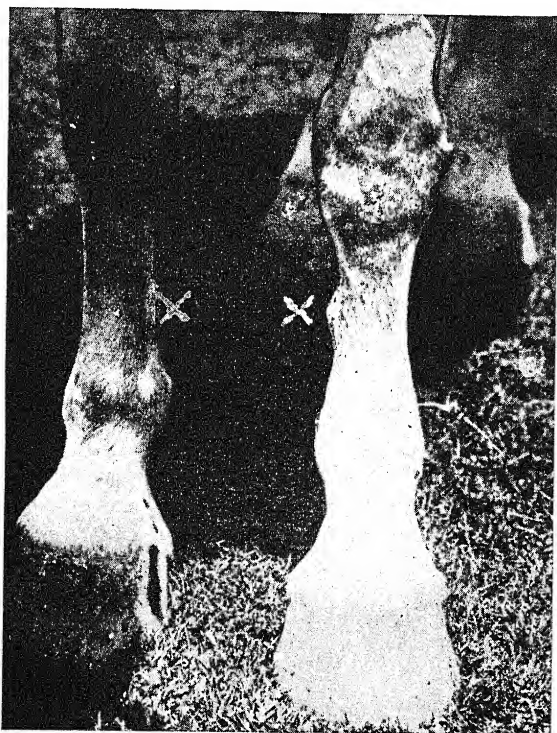


FIG. 10.—The appearance and location of a splint (X).

heavy loads, the animal is surrounded by unnatural living conditions, such as shod feet, hard pavements, insanitary stables, and general abuse from over-work and mismanagement. It is not surprising that horses suffer from such a

long list of deformities or unsoundnesses which result from these circumstances.

A short description of these deformities is given, not so much to suggest treatment, because the best is none too successful even when undertaken by experts, but rather for an understanding of these abnormalities. The treatment of any of these diseases of the feet and legs should seldom be attempted by the owner; not that harm will follow but because the application of salves, liniments and the like are, more often than not, a pure waste of time. Injuries to the tendon sheaths, for example, are always serious and careless treatment might be attended by unfortunate results. Injuries to the bones, ligaments, or tendon sheath should always be given the best attention available. The use of the knife or firing iron is never advised, except in the hands of the trained veterinarian.

Splints

A splint is a bony enlargement on the inside of the cannon bone just below the knee (Fig. 10). Splints are common on the legs of young horses, being rarely observed in older animals. The splint or bony growth may range in size from a pea to a walnut and can be seen or felt readily. Splints frequently disappear from the young animal as its age increases. The cause of these bony growths is usually given as an injury of some kind. No treatment is ever attempted except in cases of severe lameness.

Ring-bone

A ring-bone is a bony growth on the front and sides of the pastern just above the coronet or top edge of the hoof wall. Ring-bone is caused by strains, hard labor or any kind of an injury to this part of the leg and may occur on the front or hind legs. Lameness is an early symptom which may continue for months before the bone growth is noticed. A ring-bone is a more serious condition than a

splint and the treatment usually consists of proper shoeing, firing, blistering or the severing of certain of the nerves supplying that part of the leg.

Side-bones

Side-bones occur when the cartilages located on each side of the foot just above the top edge of the hoof wall become hard and bone-like (Fig. 11). Side-bones vary in size and are considered an unsoundness when found in young animals. Side-bones are best observed from the front. This disease is caused by an injury to that part of the foot with resulting lameness and is more frequent on the front feet. No treatment is attempted but relief is offered in the form of liniments, firing, blistering and cutting of nerves.

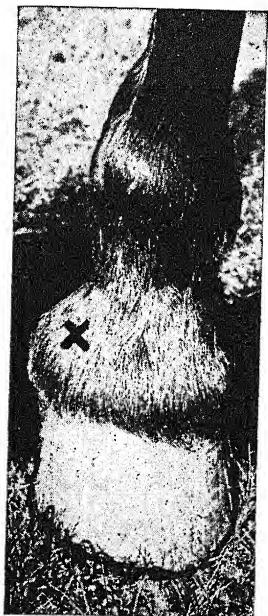


FIG. 11—The position of a side-bone (X).

Bone-spavin

A bone-spavin is a new growth of bone on the inside or outside of the hock joint. It is caused by injuries, sprains, or violent exercise. An examination of the hock joint will reveal the growth of bone at the junction of the hock and the cannon bone and close to the front. This growth increases in size rapidly and becomes large enough to be recognized easily. Spavins of this type are accompanied by more or less lameness. A simple test for spavin consists in bending the joint and holding it in this tightly flexed position for a few moments. When the foot is released and the animal moves, a distinct limp is noticed. A complete cure is impos-

sible, but relief may be secured by appropriate shoeing, firing, and blistering.

Bog-spavin

A bog-spavin is a distention or swelling of the capsule surrounding the hock joint and is located in front of and a little to the inside of the joint. The swollen capsule or sac is filled with a watery fluid sometimes called joint-water and may be easily dented. Bog-spavins are considered to be caused by sprains resulting from over-work, being seldom painful to the extent that an animal goes lame. Hot applications, liniments, and massage are recommended for home treatment. One should not puncture with knives, for infection is almost sure to follow. Tapping is a rather delicate operation and calls for great skill.

Thorough-pin

A thorough-pin is a swelling similar to bog-spavin, but is located just behind the shank bone. It usually occurs on both sides and a little in front of the so-called hamstring. The swelling is movable, filled with a fluid, and, although it may not cause lameness, is considered a blemish. Hot water and liniments are simple treatments.

Curb

Curb is a swelling a hand-breadth below the tip of the hock and is caused by a sprain to the tendon at this point. While lameness may be seen and the blemish called an unsoundness, the disease is not considered serious. Cold applications, firing and blistering are advocated in the treatment of curb.

Capped hocks, elbows, and knees

Capped hocks, knees, and elbows are swellings located respectively on the point of the hock, front of the knee, and on the tip of the elbow. They are caused by injuries and consist of watery tumors of varying size. The swellings

sometimes become infected, in which case they are likely to become troublesome. Blistering may sometimes reduce the swellings, but surgical treatment is usually necessary to remove the accumulated liquids. Lameness may or may not be observed with capped hocks, depending largely on the extent of the injury and the size of the swelling.

CHAPTER X

OTHER COMMON HORSE TROUBLES

SEVERAL miscellaneous diseases, ailments and disabilities of horses are here brought together for brief review: azoturia, heaves, colic, goiter, bad teeth, foaling troubles, joint-ill, forage poisoning, and loco poisoning.

AZOTURIA

Azoturia is a common and serious disease of horses, the exact nature of which is not fully understood. Even though little is known in this respect, certain conditions always accompany the disease with such regularity that they have come to be considered requirements.

Azoturia almost always attacks animals in good flesh and in their prime. It is rarely seen in animals on pasture and seldom affects horses working steadily every day. When animals at hard work have an unexpected vacation, with little or no reduction in their rations, azoturia may be expected. In large stables it is customary to reduce the rations over the week-end and especially when an additional holiday falls on Monday. Similar conditions may exist on any farm. Azoturia occurs more often during the winter and early spring months when the horses are not worked steadily, but may be seen any time when the above requirements are fulfilled.

Cause

It is known that a holiday on full feed after a period of hard work always precedes azoturia, but exactly what takes place in the body of the animal and brings about the

characteristic symptoms is still a matter for conjecture. From time to time various theories are advanced, but they have never gained wide acceptance. Azoturia may be due to the absorption of certain poisons or toxins that would be passed off naturally if the animal was worked steadily, but the horse shows no signs of retaining such poisons in its system until it is put to work. In other words, the exercise following the vacation on hearty feed is the aggravating cause of azoturia.

Symptoms

The first morning after the holidays the animal may be harnessed as usual and no signs of trouble are apparent; the horse is as bright as ever and steps out as briskly as on any other morning. The animal may be driven only a hundred yards or it may be worked for an hour or two, when suddenly stiffness is noticed in the hind legs and the horse often knuckles over in front. An experienced horseman will recognize this disease at once, but one who is not familiar with the customary symptoms will frequently fail to read the signs. If the animal is pulled up sharply and urged forward again, it may tremble, stagger, and finally fall to the ground. On examination, the muscles of the hind legs are found to be stiff and tense. The horse sweats profusely and may be seized with muscular spasms. The animal struggles to regain its feet and often injures itself in the attempt. One or both hind legs may be affected and only rarely are the front feet involved. During the attack the urine is always coffee-colored, this being considered a positive indication of azoturia. The reddish-brown color is due to the blood coloring matter being passed off in the urine.

Treatment

At the first signs of stiffness, stumbling, or falling, stop and unhitch, remove the harness, and quiet the horse so that it does not injure itself by struggling. If possible, place the horse on a stone-boat and haul it to the barn or nearby

stable. Try to prevent any muscular exertion on the part of the animal; this is very important because further exercise will serve to make the disease more severe. Place the horse in a roomy box-stall with plenty of bedding and cover it with blankets if the weather is cold. Bed-sores must be guarded against and the animal should be turned over two or three times a day.

After a few days an animal either shows marked improvement or it may become decidedly worse, such cases usually resulting in death. Medical treatment is complicated and should not be undertaken by the owner. As soon as the horse has been made comfortable, a veterinarian should be called to take charge of further treatment. It is sometimes advisable to place the animal in slings to support its weight, but this should be left to the judgment of the attending veterinarian.

HEAVES

Heaves is known by such other names as asthma and broken wind. It is primarily a disease of the lungs which results in a permanent over-expansion of the air-cells. In all healthy animals a certain amount of air is always retained in the lungs after each breath is exhaled, but in heaves the quantity left in the lungs at this time is greatly increased. When the horse begins to exhale air, the lungs themselves contract to force the air out; this is not sufficient so there is a second movement in which the horse brings the abdominal muscles into action in an effort to expel the air forcibly from the lungs. This results in a double movement of the flanks at each expiration of air. A healthy horse exhales in one continuous motion, while a horse suffering from heaves uses two jerky movements, the air-cells of the lungs having lost their power to contract sufficiently.

Cause

Heaves is usually associated with a digestive disorder and is thought to be aggravated by the feeding of large amounts

of bulky hay. Young animals do not suffer as much as older ones. Heaves may be an aftermath of pneumonia, bronchitis, influenza, or asthma. Over-exertion and over-feeding of roughages, especially dusty hay, are considered to be predisposing causes, but any long-continued irritation of the lungs may end in an attack of heaves.

Symptoms

This disease is seldom recognized until the horse shows well-defined symptoms. The first intimation is the appearance of a jerky cough which is often increased by exercise. The disease develops slowly but after a time the animal may be observed to exhale air with difficulty, requiring two separate movements of the flanks to accomplish the act. This symptom would be increased in severity by over-loading the stomach and intestines. The cough and difficult breathing are further increased by dust, either at work or when musty or dusty hay is thrown about the barn floor near the horses. Since the lungs are not functioning properly, the heart becomes affected and the circulation of blood slows down to such an extent that dropsical swellings may develop on the chest or belly and the hind legs may also be increased in size.

When the horse is exercised, the cough and wheezing is increased. It is common practice to disguise these symptoms with drugs and also by emptying the intestines. This trick could be easily detected by giving the animal a full feed of hay and grain, followed by exercise. The use of belladonna as a drug would be evidenced by the dilation of the pupil in the eyes.

Treatment

Relief may be given, but there is no permanent cure for heaves. The animal may live for many years and be able to do a moderate amount of light work, if some attention is paid to its diet. Small quantities of hay should be fed morning and evening and the horse worked lightly, espe-

cially after feeding. When dusty hay or grain must be used, it should be sprinkled with water. Heaves is increased when the affected horse is worked on days when the air is heavily laden with dust.

Medicinal treatment is never of great value, but in some cases it may be advisable to use Fowler's solution of arsenic to reduce the effort in breathing. Fowler's solution is given in 1-ounce doses three times a day in the drinking water. A handful of Glauber's or Epsom salts may be added to the feed twice a day until the bowels move regularly. As stated, heaves cannot be cured, but careful feeding and management will relieve the animal and enable the owner to use it for light work.

COLIC

More colic medicine has been sold to farmers than almost any other home remedy for horse diseases. In most barns there is such a bottle handy for emergencies when an animal shows any sign of a pain in the region of the abdomen. It should be understood, in the beginning, that the term colic is generally misused, because colic is only one symptom of digestive trouble and is not a disease in itself. The word colic always refers to a pain in the abdomen and this may be caused by any number of things. Colic might be called "gripes" or belly-ache.

Cause

Recognizing that colic is merely the outward sign of an abdominal pain, such a condition could and does arise from a number of entirely distinct causes, such as an indigestion or impaction of the bowels following over-loading with certain feeds, hair-balls in the intestines, poisons, or when great numbers of intestinal worms are present in the bowels. The intense pain brought on by the accumulation of large amounts of gas in the intestines, stones in the kidney or bladder, and a twisted intestine, usually cause colicky pains in the affected animal. It is important to know that colic

means pain and pain may be induced by a great variety of causes. The treatment for a stone in the bladder would not be the same as for pain caused by a stoppage of the bowels, even though the horse kicked and rolled the same in each instance.

Symptoms

It is not the intention to attempt a detailed description of the finer points necessary to distinguish the different causes of colic, because this is an exact science and veterinarians themselves very often fail to determine cause of the colic until after the animal has died. It would be better to point out to the owner the futility of giving physics until the cause is discovered. A physic ball given to an animal with a twisted intestine would only serve to increase the agony and hasten death.

Any colic may be accompanied by sharp pains or it may move more slowly and resemble a dull ache. The acute form may appear while the animal is at work or shortly after it is returned to the barn. Sometimes the owner is awakened at night by a horse thrashing about in the stable. If the animal is at large, it rolls, sweats, and breathes rapidly. The face has an anxious expression and the pulse is faster than normal. After a short period of great pain, the animal may appear more at ease but the pain soon returns with renewed vigor. Evidence of pain might follow gas colics, plain impactions of the intestines, twisted intestines, or stones in the kidney or bladder. Any animal exhibiting signs of great pain shown by rolling, kicking the belly, sweating, groaning or sighing should have help at once.

Treatment (Fig. 12)

If good veterinary service is available, never delay the call for assistance. Many horses could be saved if the owner did not wait until the animal is beyond help before treatment is begun. Do not permit an animal to go more

than two or three hours without aid of some kind. The general colic medicines contain drugs to deaden the pain and do little to relieve the condition causing the trouble.

If the owner cannot secure reliable aid and must attempt treatment, it will be best to follow a routine for a simple uncomplicated colic due to gas formation or impaction of feed. A good common remedy is made by mixing 2 ounces each of sulfuric ether and alcohol in 8 ounces of water.

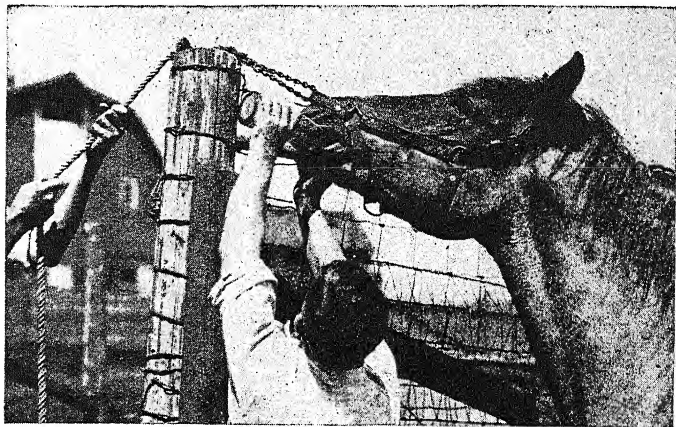


FIG. 12.—Position of the animal for drenching. Note the way the chain is fastened to the halter. This permits easy swallowing.

Another drench is composed of 2 ounces each of sulfuric ether and laudanum in $\frac{1}{2}$ pint of raw linseed-oil. Both of the above drenches may be repeated if relief is not obtained in an hour. Still another simple home remedy is 1 ounce of powdered ginger given in 1 pint of milk. A pound dose of Epsom or Glauber's salts is also good because it serves to introduce a large amount of liquid into the bowels, which often helps to loosen the impacted feed. Salts work rather slowly and the owner should wait twenty-four hours before the dose is repeated. In the meantime, give an enema of warm water and soap suds. A short length of rubber hose

well greased and inserted as far as possible into the rectum will serve the purpose. Add to this a funnel on the end of the hose and the enema outfit is complete. The admission of the warm water will have a soothing effect and help to clean out the lower bowel. In mild cases, the animal may be walked slowly. This treatment may serve the purpose, but the owner is advised to secure expert help whenever possible.

GOITER IN HORSES

Goiter in horses arises from a shortage of iodine in the diet. For a more general discussion of the prevalence of goiter, its causes and nature, the reader is referred to the description of the disease in cattle contained in Chapter VI.

Goiter in horses is easily seen because the neck is slim and clean cut with short hair. In some states this disease is very common, and as many as 30 to 50 per cent of the animals in some sections are affected. The new-born foal with goiter differs from calves in that it is seldom visible. In the absence of this symptom the animal shows mostly great weakness and usually dies after a day or two. Since it requires a careful post-mortem examination to prove the existence of goiter in foals, probably many die without the disease being recognized or some other cause being given.

While goiter in horses and foals may not be the cause of severe losses to farmers, it can be prevented by the same methods employed in other live-stock. This consists in adding potassium iodide to the normal rations fed to the mares. The pregnant mare is given iodized salt from November to April. The iodized salt may be purchased already prepared or it may be mixed at home by adding 1 ounce of potassium iodide to each 300 pounds of common salt.

BAD TEETH

Horses have bad teeth but it is doubtful whether they suffer greatly from toothache. They have irregular and

decayed teeth, but this condition is not general. Formerly, in some country districts, traveling veterinary dentists made it their business to go from farm to farm soliciting horses teeth to float or rasp. This was as customary as the spring tonic and many farmers made it a point to have all the horses teeth attended to at this time. Probably this rasping was of no benefit because the teeth were all right to begin with. Any animal off feed was considered to need its teeth filed.

Irregular teeth

Sometimes horses teeth do not wear evenly because they do not grind flush against their mates on the opposite jaw. This may cause the teeth to have irregular or sharp edges on both jaws. The rough edges irritate the inside of the cheeks and the tongue causing soreness and hinders the proper chewing of feed. These sharp edges should be filed down until they are even with the other teeth in the row.

Sometimes one tooth becomes an inch or more longer than the others on the same side of the jaw. This is because the opposite grinder is missing or does not hit it squarely, possibly glancing off to one side. This tooth may eventually grow out so far above the others as to injure the gum on the opposite jaw and cause the animal to chew on the other side of the mouth. If the long molar or grinder is in front, it may be filed down even with the others, but if it is far back in the mouth it would require clipping off to the level of the remainder of the teeth. Most veterinarians have a special instrument for this purpose.

When an animal develops finicky eating habits, chewing its food gingerly, quids and drops as it eats, the teeth should be looked after. There may be some evidence of pain and discomfort in eating, as shown by holding the head to one side and slobbering. If this condition is allowed to go uncared for, the animal will lose flesh, often causing the owner to suspect some other disease, such as worms. The soreness in the mouth makes a horse unnecessarily sensitive to the bit, causing it to become a touchy driver. Whenever

the sore spot is touched or pressed upon, the animal may start or flinch. Symptoms of this nature should always make one suspicious of irregularities in the mouth.

Decayed teeth

A decayed tooth in a horse probably feels the same to the horse as a similar condition in man, namely, pain from sensitiveness of the exposed nerve. This is often evidenced by discomfort during eating and when very cold water is drunk. If the mouth is examined, no uneven teeth are seen and it may be necessary to tap each tooth with a small hammer before the decayed one can be located. When such a tooth is badly diseased, the breath is usually very offensive. The removal of a decayed tooth is not as simple as in man and can be done only by a veterinarian.

FOALING TIME

A mare usually carries her foal about eleven months with more or less variation. The pregnant mare may be worked, but as foaling time draws near this should be lightened. A few days before the event, the animal should be placed in a lot where she may exercise at will.

Signs of foaling

An early sign of foaling is the increase in the size of the udder. About a week before the foal arrives, a waxy liquid may be noticed oozing from the teats, and as the time draws nearer this gradually changes to a white colored liquid, becoming milk about twenty-four hours before the foal is born. The vulva increases in size and discharges a colorless mucus, the belly becomes more pendulous, the flanks fall in, and the muscles of the loins recede. The mare acts nervous and uneasy, stops eating, whisks her tail, stamps, and may lie down and get up again frequently.

Foaling

If the mare is to foal out-of-doors, it is advisable to put her in a lot or inclosure where there is more or less seclu-

3 inches from the body. If the colt is standing, the end of the cord should be suspended in a tumbler containing tincture of iodine and allowed to remain two or three minutes to saturate the stump thoroughly. It is not necessary to tie the navel cord stump unless it bleeds considerably. In this case it may be tied, but the string should not be allowed to remain for more than five or six hours. There is always some blood left in the blood-vessels of the cord stump and it is best to permit this to escape. All the attention the foal needs is dipping of the cord and tying only when the bleeding is severe. This care will often prevent such diseases as joint- or navel-ill and scours.

When this part of the foaling program has been attended to, the foal should be dried with towels, if the mother does not do this herself. The first milk the foal receives from the mother is called colostrum, this being nature's own physic.

The act of foaling in most cases is an uneventful process and only an occasional mare has any difficulty. When this does happen the owner should not wait too long before help is secured.

JOINT-ILL IN FOALS

Joint- or navel-ill is a disease of foals which takes on the nature of an arthritis or inflammation of the joints. While the term navel-ill is commonly used, the disease affects the joints primarily by means of an infection that often enters through the stump of the navel cord shortly after the foal is dropped. In some of the horse-breeding sections of America the losses from this disease have been very heavy, the death rate being from 30 to 50 per cent, and many of the animals that recover are left permanently crippled and of little value.

Cause

Joint-ill is due to the entrance of germs in the navel cord stump at or shortly after the birth of the foal. Various

sion and quiet. When inside, a good-sized box-stall may be used. This should be large enough so that the mare can lie down and stretch out comfortably. Some mares foal standing while others lie down, and when everything goes well the act of foaling is over in ten or fifteen minutes. If allowed, the mare will be more likely to drop the foal when no one is about. Frequently the caretaker leaves the stall for a few minutes and on returning finds that the youngster has arrived.

Most foals come front feet and head forward, but they may be born the other way around. Since mares always foal very rapidly, any delay is dangerous and help should be sought if the foal is not born within two or three hours after labor begins. When the foal comes in its normal position of front feet and head forward, no trouble is usually encountered.

Besides foaling easily and rapidly, mares differ from cattle in that the afterbirth is very seldom retained to exceed four or five hours. In most instances it passes out soon after the foal is born.

Care of the dam and foal

In a standing birth the navel cord which attaches the foal to the placental membranes breaks as the new-born foal drops to the ground, but if the mare is lying down, the cord is usually broken when she gets to her feet. The mare does not require any special after-care other than attention to her feed. The ration should be made up largely of bran mashes and limited quantities of hay, allowing about a week to elapse before she receives her customary feeds. Exercise is important to mother and foal and, weather permitting, both should be allowed out-of-doors as much as possible.

Soon after the foal is born, the navel cord should be disinfected with tincture of iodine. The portion of the cord attached to the foal may be 2 to 6 inches long; when it is longer than this it may be scraped off at a distance of 2 or

types of germs have been found in such cases, but the most frequent is the same that causes abortion disease in mares. Unless careful attention is paid to the proper disinfection of the navel when the foal is born, this disease may follow. Some believe the enlarged joints are hereditary, but there is no foundation for this.

Besides the navel, infection may take place in the foal before it is born. This would indicate that the mother harbored the germs in her body and transmitted the infection to the unborn foal. This is thought to be probable because many foals are born with the typical enlarged joints of this disease. The infection of the foal while it is in the womb takes place through the interchange of blood from mother to the foal through the medium of the placental membranes.

There is also a possibility of the infection taking place by mouth when the foal sucks the mother. The germ of this disease has been found in the udders of infected mares and the fact that certain mares give birth to foals year after year which become infected with this disease lends strength to this belief. A chronic infection of the udder with this germ would reduce the value of the mare to such an extent that it is doubtful whether she should be used for breeding purposes.

Symptoms of joint-ill

Evidence of joint-ill may be observed at the birth of the foal or it may be noticed for three or four months, even longer at times. In most cases, at least one joint is enlarged, the hind legs being affected most. The joints are inflamed and painful, the animal showing a tendency to avoid moving any more than it can help.

When the owner first notices the enlarged joint, he may think it is due to an injury of some kind, but this is rare. As the infection in the joint increases, pus may be formed followed by a rise in temperature, together with rapid breathing and irregular appetite. When the joints become

so painful that the animal cannot stand to suckle, there is a rapid loss of flesh and death is not long delayed.

The navel also often shows a discharge which accounts for the term navel-ill. The navel stump is found to be moist and dripping a blood-stained liquid which may contain pus. When the infection becomes general throughout the body of the foal, pneumonia often develops. This is serious and usually causes death. The swollen joints, fever, inflamed and dripping navel would be relatively certain to indicate joint-ill.

Treatment

The chances for the recovery of a foal affected with joint-ill are not the best. When recovery does take place, the foal is often so badly deformed as to be valueless. Foals that develop the disease very soon after birth usually die.

Drugs are of little use in the treatment of joint-ill. Good nursing is helpful, but it is doubtful whether this alone is sufficient. Vaccination of foals within twenty-four hours after they are born has been tried with varying success. Immune serums have also been advocated. Either or both of these methods may be further perfected until they are entirely satisfactory in preventing the development of the disease, but until such time many foals may be saved by prompt and careful disinfection of the navel. This, of course, will not prevent the infection which takes place before the animal is born. It should be remembered that a mare carrying the disease in her body is a constant source of infection to the new-born foal, and for this reason should not be used for breeding purposes.

FORAGE POISONING

The term forage poisoning is so carelessly used that many farmers have the mistaken idea that the disease is always associated with moldy hay, grain or silage and, as a result, the death of horses unaccountable to any other cause is often

attributed to molds. Other names given this disease are cerebro-spinal meningitis and sleepy or blind staggers. Horses, cattle and other farm live-stock may become infected, but horses suffer most.

Cause

Forage poisoning is not a contagious disease in the sense that it is transmitted from one animal to another. It is contracted by eating feed in which has grown a microbe called *Bacillus botulinus*. This particular germ is widely distributed in nature, but it must have very special surroundings before it can grow or multiply. The botulinus germ cannot grow successfully when air or oxygen is present. The germ itself is perfectly harmless, except that it produces or secretes a poison or toxin wherever it is able to grow and it is this toxin that is so poisonous to animals. The disease is not considered contagious, because each animal that becomes ill must have partaken of the feed containing the poison, not the germs themselves. An animal could swallow the botulinus germs themselves and no ill effects would follow, because these germs do not grow in the animal's body. All the growing, multiplying, and poison secreting takes place in some article of feed outside of the animal body. Briefly stated, the germ finds a favorable place to grow, in a silo for example, produces its poison which live-stock eat, and when large numbers of horses are affected with the disease it indicates that all have eaten from the same part of the silo that contained the poisonous silage. The infection was not carried from one to another. A similar situation might occur when several persons become poisoned after eating from the same jar of canned goods affected with this poison or toxin.

Why moldy silage is blamed

The botulinus germ thrives on decomposed or decayed vegetable matter and does not attack any living plant or animal. Since the germs of this disease are widely dis-

tributed, it is easy to understand how simple it would be for them to gain entrance to a pile of hay, grain, or into a silo. Even when they find lodgment in these places they can do no harm unless the conditions are ideal for the germs to grow. The conditions necessary for their growth are moisture, warmth and absence of air. The lack of air is important and for this reason the poisonous fodder is usually found deeply buried in the pile.

These same conditions of heat and moisture are extremely favorable for the development of innumerable varieties of molds and, since molds require more or less air, they are more often seen in the top layers of the silage. The moldy growth mats the silage together and forms a blanket which effectively keeps the air from that below. When this preparatory process is complete, the botulinus germs underneath have the conditions necessary for their growth, namely, moisture, warmth, and no air. From this, the reader will readily understand why moldy silage or hay is accused of causing trouble.

It is impossible to tell by observation whether silage is poisonous. When the botulinus germ grows it does not change the appearance of the silage in any way.

Molds themselves are not known to be harmful to livestock, and when deaths of horses follow the use of moldy silage or hay, it is very probable that the molds were not to blame, but were merely present in addition to the actual cause, the toxin secreted by the botulinus germ. Some silage may contain the poison of the botulinus germ without the presence of any molds, but unfortunately most silage is moldy and this causes confusion as to the actual cause of forage poisoning.

Silage is not good feed for horses and if quantities of molds are fed it may produce a digestive disturbance. Clean silage or hay is not likely to be dangerous, but when moldy it may be harmful, though not on account of the molds. Some forage may appear wholesome and yet be highly poisonous. When the feed is suspected, sterilize sev-

eral fruit-jars by boiling for fifteen minutes; do not use antiseptics; dig down under the surface of the suspected feed and pack the containers tightly with the fodder; seal firmly, using ordinary preserving rubbers, and send to a state agricultural college for a laboratory examination.

Symptoms of forage poisoning

Botulinus or forage poisoning does not occur immediately after the contaminated feed is eaten. It usually takes three to seven days before an animal becomes ill, so that the feed eaten the day before the sickness appeared might not be at fault, unless it was being fed continuously.

The first symptom noticed may be weakness, which might further develop until the horse staggers. The eyesight is impaired and there may be some difficulty in swallowing food or water. The temperature may remain normal or even below. Later, the appetite disappears and paralysis increases until the animal falls to the ground. The pulse and breathing are faster than usual and there may be periods of delirium shown by violent struggling. In some cases death may occur at any time, from six to twelve days, but in very severe attacks an animal may die in a much shorter time.

Treatment

There is no entirely successful method of treatment. Serums and anti-toxins have been used but they have not been wholly satisfactory. Their use is suggested, but the results are not always to be depended on.

As prevention, silage, good or bad, should not be fed. The digestive system of the horse is not adapted to this kind of fodder and almost any other forage is better. If it must be fed, only clean silage should be used. Even though its cleanness is not a guarantee that it is safe, it is an added precaution. The damaged portions of the hay or silage should be discarded, keeping in mind that though the molds themselves probably do not harm live-stock, they make it

easier for the botulinus germs to grow and produce their deadly toxin.

LOCO POISONING

Farm horses seldom suffer from plant or weed poisoning, but range horses are affected by a few. The most important of the weeds poisonous to horses is the loco plant. There are several varieties, a more complete description of which is given in Chapter VI.

At first, horses do not like to eat the loco plant, but are often driven to it by a shortage of other fodder. After several trials they come to like the flavor and may acquire such a craving for the weed that they will eat it, even though better and safe forage is available.

The first symptom is a loss of condition, followed by weakness and staggering, together with loss of muscular control generally. A normally gentle horse will shy at the least provocation and cannot be led forward or backed easily. When started forward, it keeps on going and may run into anything that lies in its path.

Treatment

Animals must eat the loco plants for a long time before they become visibly affected, and when the first symptom is noticed they should be removed from the dangerous range and given safe forage. If left to themselves the animals will continue to eat the loco plants until they die.

If the attack is mild an animal may recover, but if the horse is badly locoed, treatment is not always successful. The horse must be of sufficient value to warrant the time and expense of the treatment. The usual method of handling such cases is to give daily doses of 4 to 6 drams of Fowler's solution. Alfalfa is good forage, because the horse is usually constipated and the alfalfa will have a tendency to increase the bowel movements.

PART III

DISEASES OF SHEEP

CHAPTER XI

INFECTIOUS DISEASES OF SHEEP

THE important infectious diseases of sheep are few in number and relatively uncommon. Many of those that cause the loss of sheep also affect cattle and other live-stock. Among these might be mentioned anthrax, blackleg, and hemorrhagic septicemia. Abortion will be mentioned but the disease as yet is not a serious menace to the sheep industry. Tuberculosis will be omitted because it is very rare in sheep and losses are so few that farmers need feel no concern.

An occasional flock may be affected with anthrax or blackleg, but these diseases do not kill many sheep except in certain localities in which the soil is heavily seeded with the germs. Tetanus or lock-jaw, rabies, sheep-pox, foot-and-mouth disease, and actinomycosis may affect sheep, but these diseases, also, are so uncommon that most farmers have had little or no experience with them. This latter group of diseases is not included in this chapter but an interested reader may refer to the cattle section for a description.

BLACKLEG

Blackleg in sheep is caused by the same organism responsible for this disease in cattle. It is infectious, the germ

living in the soil. Infection usually takes place through wounds or cuts in the skin. It has been contended by some that the germ of blackleg in sheep differs from that of cattle, but this view is not widely accepted.

Evidently sheep are not so susceptible to blackleg infection as cattle and have more natural resistance, because they frequently range unharmed on fields where cattle have died. However, they may become infected through skin wounds, especially after shearing operations. At this time sheep are often closely confined to corrals or inclosures where cows may have died of blackleg. After blackleg has passed through sheep, its virulence or disease-producing ability is greatly increased for other sheep. Young sheep and lambs suffer most, but older animals may become infected.

Symptoms

As in cattle, blackleg is characterized by swellings under the skin in various parts of the body, the hind quarters and shoulders being the favored places. A crackling sound is heard when the hand is passed over the swellings, indicating the presence of gas or air under the skin. The swellings are much more noticeable in lambs because of the absence of a heavy wool coat. If the disease could be observed from its beginning, the sick sheep would probably show the usual train of symptoms, such as fever, lack of appetite, and suspended rumination. There would also be rapid breathing and increased pulse rate. The flock owner seldom notices anything other than that the animal is sick or it may be found dead in the pasture. Sheep do not withstand any disease very long and usually die quickly after infection takes place.

The sheep must be opened immediately after death if any of the typical changes in the carcass are to be recognized. Decomposition or decay sets in rapidly, especially in warm weather, and this will quickly destroy or make unrecognizable the muscle changes. The muscles at the

point of the swellings are black and, when cut into, the blood is observed to be frothy or filled with air-bubbles. A sweet sickish odor is noticed the same as in cattle blackleg.

The flock owner may be confused between this disease and anthrax, making a laboratory examination of the tissues necessary for a positive diagnosis. The swollen gas-filled muscles together with the sweet odor are considered positive evidence of blackleg, but there are many cases in which these changes are not pronounced enough for the inexperienced person to be certain. If anthrax is unknown in the section where the losses occur, blackleg would be suspected first, but if the farm is infected with anthrax there would be a chance for mistake. The laboratory test would show the presence of the germ of either disease and should be resorted to when any doubt exists. In doubtful cases a veterinarian should be consulted. If there is any possibility of anthrax, the owner should use every precaution to prevent infection to himself, because anthrax is fatal to man. Under no circumstances should the carcass be skinned if anthrax is suspected.

Treatment

There is no drug treatment for sheep affected with blackleg. As soon as the disease is recognized, the flock should be promptly immunized or vaccinated with blackleg aggrassin. The regulation of dosage and the vaccination is best handled by a veterinarian, but lacking such service it may be done by the owner. The directions of the manufacturer of the vaccine should be followed closely. The aggrassin type of vaccination gives excellent results when properly administered.

ANTHRAX

Anthrax is more frequent in cattle, but sheep are highly susceptible and die in large numbers after infection enters the flock. While anthrax is not widely distributed, it occurs on farms during an outbreak in cattle or it may begin inde-

pendently in those sections in which the disease is localized. The germ of anthrax lives in the soil a long time, being practically impossible to eradicate from a farm. In this country infected farms commonly center about a tannery where refuse from hides has been allowed to contaminate the streams in the neighborhood. When the stream overflows in the spring of the year, many acres of pasture may become infected and made unsafe for grazing. Anyone desiring a more complete description of anthrax should consult the disease as it affects cattle.

Symptoms

Sheep of all ages die of anthrax. They contract the disease through wounds or cuts and also through the mouth when eating or drinking infected material. The time elapsing from infection to sickness varies, but it is only a few days at the most. The symptoms would not enable a farmer to detect anthrax. As a rule, a sick sheep does not show distinctive signs that would differentiate this disease from any other of a similar nature. The animal merely appears weak, breathes rapidly, and soon collapses and dies after a brief struggle. A sheep affected with anthrax lives only a few hours after it becomes noticeably ill.

Anthrax is a blood disease and the veins teem with billions of the germs, making it extremely dangerous to open such a carcass bare-handed. If an outbreak of anthrax in cattle is in progress on the farm, it is reasonable to suspect the same disease in sheep. Anthrax is a rapidly moving infection and hemorrhages are seen throughout the body. The opened carcass would be of no particular value in arriving at a correct diagnosis, because the changes are not striking enough to make certain recognition possible. A trained veterinarian could not make a positive statement on the appearance of the carcass alone. If there is the least reason to suspect anthrax, an ear should be cut off and sent to a laboratory, packed carefully in a sealed container, so

that no one will be exposed to the infection while the package is in transit. It would be best to allow a veterinarian to attend to shipment.

Treatment

Medical treatment is never attempted. The flock should be vaccinated at once by the double method, which consists of the serum and spore vaccine administered at the same time. This is very much like the double treatment for hog cholera, except that in cholera the immunity lasts for life while in this case it is good for only a year. This method of anthrax vaccination is very reliable, but should not be used by unskilled persons. The dosage for sheep is much less than for cattle and, as sheep are highly susceptible to anthrax, the slightest overdose might cause death. The double treatment should be employed only where the disease is localized, because, if carelessly used, widespread infection of the soil might follow. The spore vaccine contains the live germs of anthrax and great care should be observed. On badly infected farms all susceptible animals should be vaccinated each year. Anthrax aggressin is sometimes favored because it does not contain the live germs of the disease. It may be used instead of the spore vaccine with excellent results.

All carcasses of dead sheep should be burned or buried six feet under the ground; do this immediately before flies, birds, or dogs have an opportunity to attack the carcass. An animal should never be skinned for its hide if anthrax is suspected. This would apply equally to animals that die of any disease. These hides must be handled after they leave the farmer's hands and frequently innocent persons die from infection at some place far away from the farm where the disease occurred.

HEMORRHAGIC SEPTICEMIA

Hemorrhagic septicemia is a contagious disease of sheep closely allied to that in cattle. It affects young and old

sheep alike and may occur in either the acute or chronic form.

Cause

The germ causing hemorrhagic septicemia is widespread in nature and is often found in the air passages of healthy sheep. If the vitality or resistance of the sheep are lowered by undue exposure, lack of condition from poor feeding, or in the early stages of some other disease, these ordinarily harmless germs become active, increase in strength and numbers, and finally succeed in overpowering the affected animal. If the sheep was healthy and vigorous, the germs might not have been able to secure a foothold. This ever-present germ goes into action when the natural resistance of the animal is reduced.

Symptoms

The animal becomes dull, listless, and loses its appetite. Since pneumonia is a common complication of this disease, there may be rapid breathing accompanied by frequent coughing. The animal has a fever and often shows a discharge from the eyes and nose. A foul-smelling diarrhea is usually noted. Lambs are the first to become affected and die, but the older sheep succumb later in the attack.

This disease may move rapidly and death take place after a few days sickness, but sometimes animals are ill for a long time, becoming very thin and walking with great effort. In the chronic cases the animal usually dies from sheer exhaustion.

When an animal is opened after death, the principal changes in the carcass are hemorrhages throughout the internal organs. The blood-vessels of the heart are congested with blood and pin-point hemorrhages may be seen on the surface of the heart muscle. The lungs may be solid and liver-like in consistency or spotted with small hemorrhages. The unskilled observer will be unable to

identify this disease. Positive diagnosis usually requires a laboratory test.

Treatment

Drug treatment is seldom undertaken. Anti-hemorrhagic septicemia serums and vaccines are frequently used, but their value is not rated highly. Since the flock is often in a run-down condition, its natural resistance must be built up by attention to proper feed and care.

NECROBACILLOSIS

Necrobacillosis is a long name and may be abbreviated to *necro*, and this is the term commonly used. The disease is often caused by a germ which is widely distributed in nature and frequently in the intestines of healthy animals. This germ produces a group of diseases in sheep, the signs of which are almost identical with *necro* in small pigs. The sheep diseases caused by this and other filth germs are sore mouth of lambs, lips and leg ulceration of older sheep, foot-rot, navel infection, and a disease of the sheath of bucks and wethers.

Damp or wet weather, together with insanitary quarters, favors infection to such an extent that *necro* is many times referred to as a filth disease. Sheep, unlike swine, do not suffer from the intestinal form of *necro*. Necrobacillosis in sheep is dependent on cuts in the skin for entrance into the animal, and for this reason it is considered a wound infection disease.

When sheep are rotated on clean pastures, infection seldom takes place. Wet and muddy corrals or yards that have been in use a long time are favorable places for infection. Such yards, even though badly infected with necrosis germs, are only dangerous to animals with cuts or scratches on the skin.

Sore mouth

This form of *necro* affects lambs most and is seen more often in the late summer or fall but may occur any time

conditions are favorable. The disease appears as sores about the lips, corners of the mouth and nose. The sores may be about the size of a pea and when many are present they may run together to form a large patch of scabby or ulcerated skin. The germs of necro enter through a cut in the skin about the lips and mouth and eat their way into the healthy tissues. In some cases all the skin about the lips and mouth may be a raw bleeding mass, frequently so painful that the animal will refuse to eat.

If possible, the cause of the disease should be removed by changing the flock to clean dry quarters. When treatment is begun early and there are only a few sores, good results may be obtained by using a 10 per cent solution of nitric acid or full strength tincture of iodine. Prepare several swabs by wrapping some cotton about the end of small sticks. Remove the scabs and scrape off dead tissue underneath until the fresh clean flesh is reached. This frequently bleeds so that it may be necessary to apply a piece of cotton to stop the hemorrhage. Soak a swab in either the dilute acid or the iodine solution and apply to the sores. If nitric acid is used, care should be taken that it does not run over on the adjoining healthy skin. A little vaseline smeared on the skin about the sores will help to prevent injury to the nearby skin. If the treatment is well done no further attention is usually necessary, but some stubborn cases may require an additional application a day or two after the first treatment. If the dilute nitric acid or iodine is not available, any good coal-tar dip solution will serve the purpose.

Lip and leg ulceration

This disease is essentially the same as sore mouth, but the combination name is used when infection occurs on both the mouth and legs. Lambs are more likely to be affected with sore mouth, while older sheep may exhibit the sores in both places. Even though the name is slightly different, the cause and disease itself is the same.

No special description of lip and leg ulceration is neces-

sary, because the sores are identical with those of sore mouth. The sores near the mouth may involve the nose and, when extensive, are very difficult to treat. Portions of the side of the jaw are often so badly eaten away as to expose the teeth and the head may be swollen. Grazing is interfered with and the affected animal is usually in very poor condition.

The leg sores are chiefly in the region of the ankle and about the top of the horny part of the foot. They are raw sores or scabby ulcers.

When a large area about the nose and mouth is affected, treatment is very laborious and does not always give good results. To be successful, the treatment should be undertaken in the very early stages, before much of the skin is diseased. When the sores about the mouth and on the legs are small and few in number, treatment is the same as for sore mouth in lambs, namely scraping out the sores until they bleed, stopping the flow of blood with cotton, and the application of a 10 per cent solution of nitric acid or full strength tincture of iodine. Apply either solution with a cotton swab tied to the end of a stick. Repeat the treatment if necessary.

Foot-rot

Foot-rot is due to infection by necrosis germs and is observed more often when sheep are quartered in muddy corrals that have been in use for a long time. The mud is laden with the germs and they easily enter through breaks in the skin between the toes. An opening or cut in the skin is necessary before the germs can enter. The muddy yard would tend to irritate the skin of the foot and cause it to crack and bleed. The infection works its way into the inner parts of the hoof and may even cause the horny part of the foot to slough off. The animal limps badly because the foot and leg are swollen and very painful. A foul odor is noticed when the foot is examined.

Clean dry quarters are essential if this disease is to

be controlled effectively. This form of necro is also a direct infection from the soil and good management will be necessary to prevent its further spread. It is useless to treat the sheep if they are left in the same infected yards or corrals.

When treating an infected foot, first all the dead or diseased tissue between the toes should be scraped away. If there are any pockets of pus deep in the hoof itself, they must be opened and drained. After the foot has been carefully cleaned and washed with hot water and soap suds, it should be dried with a towel and 10 per cent nitric acid or full strength tincture of iodine applied with a swab. A little pine-tar may be smeared over the sore part of the foot after treatment is completed. Coal-tar dips may also be used to treat the sores.

No treatment is worth while unless the diseased part of the foot is entirely removed. It is a sheer waste of time to spray disinfectants over the foot without first scraping away the diseased part of the hoof. The above treatment must be repeated every other day until recovery takes place. The treated animals should be kept in an inclosure well bedded with clean dry straw.

Driving the affected animals through a solution of dip has been advocated, but this is not satisfactory. The hand treatment takes time and effort, but this must be expected if recovery is sought.

Necro or venereal disease of the sheath in bucks and wethers

Bucks and wethers sometimes become infected with the germs of necrosis when they are forced to lie on wet ground or in badly soiled litter or manure. This disease usually occurs alone without sores about the mouth, legs, or feet, but there is nothing to prevent a combination. Rainy weather is especially favorable for the development of this form of necro. The infection of the sheath is most frequent during the late summer and early fall months.

The disease appears at the end of the sheath in the form

of raw sores or ulcers. There is always some swelling which usually renders the animal unfit for service on account of the pain accompanying the act. The sores may at times spread to the penis. It should be remembered that this disease is not markedly different from sore mouth or foot-rot, except in the location of the infection.

The entire flock or, at least, the affected males should be removed to clean and dry quarters and the bedding changed frequently. The raw sores should be cleansed with warm water and soap suds, dried and swabbed with full strength tincture of iodine. The dilute nitric acid is not suitable for use in this type of necro. Several applications of the iodine may be necessary before recovery takes place.

Ewes sometimes become infected about the vulva with the same kind of raw sores. The treatment would be the same as for the infected sheath.

Navel disease or necro of the liver

This is still another variation of necrobacillosis, being caused by the same germs responsible for the other diseases discussed in this group. It is a disease of new-born lambs, the principal evidence of infection being in the liver. The navel cord merely acts as the avenue through which the infection enters the body of the lamb. The navel cord contains blood-vessels, one of which communicates directly with the liver, making it easy for the germs to reach that organ.

Navel infection or necro of the liver results when ewes lamb in dirty sheds. When the lambing season is in full swing, hundreds of ewes lamb in a comparatively short time and the attendants are so hard pressed for time that the new-born lambs often receive very little attention. If the navels of the young lambs become soiled with the dirt or filth of an infected lambing shed, infection may occur. On some large sheep ranches as many as 500 lambs have been lost in one season from this cause.

The germs enter through the bleeding end of the cord

the legs and are said to have rheumatism. The disease is nearly always fatal and no effective treatment can be suggested. The examination of the carcass after death does not show any typical changes that would identify this disease.

Prompt disinfection of the navel is also advised as an effective means of prevention.

ABORTION IN SHEEP

Abortion as a specific infectious disease of sheep is uncommon. Occasional outbreaks of abortion have been reported, but authentic cases of the same nature as in cattle or mares are rare. Various causes are given for the occurrence of this disease. In the future, abortion as a specific disease may be a factor in sheep husbandry but at present its inroads are not generally considered serious.

It is probable that some ewes may abort when they are in a weakened condition following infection with some other disease such as hemorrhagic septicemia. Ewes that have been handled roughly or run by dogs may abort. Ergot and molds are frequently accused of causing abortions in sheep but reliable reports of this are uncommon.

If an outbreak of abortion should occur in a flock, the aborting ewes should be separated and the fetuses and after-birth burned. If the number of abortions is large, an investigation should be undertaken to ascertain the cause.

CHAPTER XII

PARASITES OF SHEEP

SHEEP suffer more from the attacks of parasites than any other class of farm live-stock. With few exceptions more sheep die from parasitic infestation than from all the other diseases combined. The losses are largely confined to young sheep and lambs, although older animals may be affected. Young sheep and lambs have very little resistance and fall easy prey.

The life histories and habits of most of the common parasites of sheep are well known. This should make it easier to formulate plans for the prevention of severe losses, but most farmers must learn by experience that treatment for most of these diseases, while helpful in controlling an outbreak, will not eradicate them entirely unless pasture rotation is practiced. This applies especially to intestinal worms.

Ordinarily when sheep are infested with any parasite, there is gradual loss in flesh, progressive weakness, and diarrhea. When a number in a flock shows such symptoms without other apparent cause, parasites should be suspected. It is never good policy to wait until several die before beginning an investigation, because by that time many more sheep will have become infected and many will be too far gone to withstand treatment.

Often a healthy flock becomes infested with parasites through the purchase of animals at farm sales or from public stockyards. Such practices should be avoided as much as possible. These newly purchased animals frequently harbor a variety of parasites and unless they are

kept separate from the home flock for some time, disease may be introduced. It is always a safe plan to quarantine the new purchases until they are known to be healthy.

When a flock becomes infested with parasites, the first necessity is to recognize the particular one causing the damage and also to be fully informed concerning its habits. Armed with this information, intelligent steps may be taken to control if not completely eradicate the disease. There are entirely too many hit or miss methods used in the treatment of sheep affected with parasites. No drug or chemical put in the drinking water or feed will expel worms effectively or drive lice, mites, or ticks from sheep. Individual treatment is necessary and, being troublesome, is often unpopular. It is hoped that the discussion following will help the flock owner to recognize the common parasites of sheep and to take the proper steps necessary to handle situations as they arise.

PARASITES AFFECTING THE EXTERIOR OF SHEEP

This group comprises those parasites that live and feed on or in the skin of sheep. While they do not often cause the death of the affected animals, they hinder their normal growth and are a source of great annoyance both to animal and owner.

Lice

Sheep lice are not as important as the ticks or mites, but they are reported in various parts of the country and are worthy of discussion.

Kinds of sheep lice

Three kinds of lice affect sheep, two blood-sucking and one biting. One of the blood-suckers is a body louse and is found on any part of the animal, while the other, a foot louse, lives on the hair of the lower parts of the legs. The biting louse is commonly called the little red louse and may be found anywhere on the body. It is difficult to say which

is the most objectionable, because the sucking lice puncture the skin and actually suck blood while the biting lice cause great discomfort as they nibble at the skin of the animal.

It is important that the flock owner be able to distinguish the sucking from the biting lice, because in some cases the treatment differs for the two varieties. Lice are only about $1/25$ inch long and, while they may be seen with the naked eye, it is easy to overlook them entirely. The sucking lice are larger than the biting and have long-pointed heads designed to puncture the skin, while the biting lice have short rounded heads which are broader than long and constructed for chewing and grinding the skin.

All three kinds of lice spend their entire lives on the skin of sheep, being unable to live more than a week when they are separated from their host. The mature females of all varieties lay their eggs or nits on the hair close to the skin. The nits hatch in ten to twenty days. When the young newly-hatched lice are about ten or twelve days old, they begin to lay eggs and so another life cycle is begun. Lice may be found on sheep during the summer, but do little damage, the winter months being the time when they are most active.

All lice move about on an animal more or less and do not confine their operations to any one locality. Perhaps an exception may be made in the case of the foot louse, but even this one is sometimes found away from its natural feeding ground. In general, the biting lice may be present anywhere while the sucking lice favor the places where the wool is light. Any of the lice may be seen on close examination of the skin and wool.

Lousy sheep rub themselves frequently against posts, feed-racks, or any other rough object in an effort to relieve the intense itching. If within reach, they may try to bite or scratch the place where the irritation is greatest. The animals become restless, and much time is spent fighting the lice that might better be used in grazing or at the feed-racks. The wool may become loose or matted from the

continual rubbing and frequently bare spots are seen. Whenever sheep are observed to scratch or rub themselves, lice, mites or ticks should be suspected and a careful examination made.

Treatment for lice

Dipping is the surest and best way to rid sheep of lice and this should be done when the number warrants the labor involved. The treatment will kill all three kinds, but two dippings fourteen days apart are necessary to get rid of the lice that hatch from nits after the first application. All of the coal-tar dips sold under various trade names are reliable and should be used according to the directions on the container. Dipping should never be practiced in the winter. Powders are better for winter use. Sometimes the coal-tar solution is used in a sprayer, but this is not satisfactory because it is almost impossible to penetrate the wool thoroughly.

Hand applications of lice dusting powders are not efficient but are often necessary during the winter months when dipping is out of the question. Sodium fluoride is very effective to kill the biting lice, but is of no value when used against the blood-sucking varieties. The dust may be applied by hand, from a sprinkler can, or with a blower, being careful not to rub the powder into the skin and keeping it away from the mouth, nose, and rectum. About 5 pounds of this powder will treat 100 sheep at a cost of about 2 cents an animal. Although this treatment does not eradicate the lice completely, it will make life easier for the sheep until they can be dipped safely. It takes about fifteen minutes to treat one animal. The powder is non-poisonous to man or animal when properly used.

Both the biting and sucking lice may be destroyed by almost any of the commercial louse powders that contain a large percentage of pyrethrum or naphthalene.

Equal parts of powdered sabadilla seed and sulfur may also be used in the form of a dusting powder. It usually

requires more than one application of any of the dusting powders to secure comparative freedom from lice.

Ticks

Any farmer who raises sheep is familiar with ticks because they are by far the most common of the parasites affecting the skin. Ticks are said to favor the coarse or medium wool sheep, but they may be found on all breeds. The sheep tick lives entirely on the blood of sheep and, when badly infested, the animals are likely to be very unthrifty and fatten slowly.

Life and habits of ticks

Sheep ticks are in reality wingless flies and do not resemble the true tick in any way. Their shape and structure are different, the sheep tick having only six legs while the true tick has eight.

No one should ever confuse lice and ticks, because the latter are fully $\frac{1}{4}$ inch long while the lice seldom exceed $\frac{1}{20}$ inch. The full-grown tick is brown in color and is able to move rapidly about the skin and wool.

Unlike its relatives, the flies, the tick does not lay eggs. The egg and larva or unborn ticks develop inside the female and when the time is ripe they deposit the pupa (larva of the ticks inside their case) on a convenient hair. Here the baby ticks incubate further inside their sheath or covering and finally burst out of the egg-like covering in about nineteen to twenty-four days. Warmth and moisture hasten the incubation period. The young ticks are nearly as large as the adult insect when they emerge from the shell. They now suck blood, become of age in three or four days and the females begin to lay after eight or ten days. Ticks spend their entire life on the body of the sheep and are able to live only six or seven days after leaving their host.

Ticks spread from one animal to another by direct contact, especially when sheep are closely housed in the winter.

A tick might easily fall from one animal and crawl over the litter to another nearby sheep. The shepherd may carry ticks on his clothing.

How ticks injure sheep

Ticks seldom, if ever, cause the death of sheep. They do most of their damage by sucking blood or chewing the skin or wool. The tickling or itching sensation caused when the ticks bite or puncture the skin irritates and annoys the animal so much that it scratches and rubs continually. The wool becomes matted, the appetite of the animal is reduced, and if the ticks are very numerous, the sheep becomes unthrifty and develops slowly. Often sheep are so busy resisting the attacks of the ticks that much time that might well be spent eating is wasted. The ticks are easily recognized when the wool is parted. The value of the wool is reduced because of its matted and dirty condition.

How to rid sheep of ticks

While it is not especially difficult to rid sheep of ticks, it is a real problem to keep them free, as ticks are so readily carried to the clean flock by the caretaker and by animals purchased from an infested flock.

Dipping is by far the best method for tick eradication. Sheep dips are numerous and mostly reliable if the directions of the manufacturer are closely observed. Many of the commercial dips are coal-tar solutions and are sold under a variety of trade names. It is always necessary to dip the flock twice, about twenty-four days apart. The arsenic dips should never be used for this purpose, because they are dangerous to man and animals alike when applied carelessly. It is needless to say that dipping should not be practiced during cold weather.

If the ticks become very troublesome in the winter, dusting powders may be tried. The owner of the flock is warned that this method is very laborious and time-consuming and is practical in small flocks only. It usually takes about ten

minutes to treat an animal properly and it is often necessary to repeat the dusting a second or third time. The dusting powder is applied in a shaker-top can or by hand. An assistant is necessary to hold the animal and separate the wool as the powder is dusted in. The dusting powders should be used over the entire body, not on the outside of the wool coat, but deep in among the wool fibers. Dusting is only advised for temporary relief during the winter when dipping is dangerous.

Pyrethrum powder or equal parts of powdered sabadilla seed and sulfur may also be used for dusting. The feeding of sulfur or medicated salt as a preventive of ticks is a waste of time and money.

The ear-tick of sheep

The spinose ear-tick, so named because of the minute spines or pricklers on its back, is an oval eight-legged parasite. The ear disease caused by this tick is seldom, if ever, seen in northern sheep, but is common in the South and Southwest. True ticks of any kind do not thrive or live in the North on account of the long and severe winters, and for this reason are rarely found except in warm climates.

The ear-tick has a life history very much like the Texas fever tick, in that it must pass through the different stages of its life both on and off the animal. The ticks reach the body of sheep from the ground and crawl into the inner parts of the ear. Here they suck blood and pass through another molting stage, finally becoming eight-legged. The ticks stay in the ear for several months and when numerous clog the ear with accumulations of ear-wax and other secretions. The affected animals shake their heads and carry them to one side in an unsuccessful attempt to dislodge the intruders.

The method of treatment for ear-ticks in sheep is the same as that for cattle or horses. A mixture of pine-tar and cottonseed-oil is injected into the ear cavity with excellent

but a magnifying glass will make their recognition easier. This type of mange is the usual one encountered on farms or ranches.

The female mite lays about fifteen eggs during its lifetime and sticks them to the skin at the roots of the hair. The eggs hatch in three or four days and reach maturity in ten to fourteen days. After this, the process is repeated. Beginning with one female mite it has been estimated that 1,500,000 mites may be produced in ninety days. This mite lives only on the surface of the skin and spends its entire existence on the body of the affected animal.

As the mites feed on the skin of the sheep, they cut holes in the skin and deposit a poisonous substance which causes it to become inflamed and reddened. This is a very early stage and the owner of the flock will rarely notice this condition. The mites multiply, irritating the skin constantly, until pus or water-filled pimples form over the affected areas. This causes intense itching and the animals scratch and rub themselves incessantly. The constant rubbing causes the pimples to break and run together with subsequent scab formation and thickening of the skin.

The wool coat becomes matted, torn, and bare in spots. As the disease progresses, the bare spots increase in size until large patches of hairless skin appear. The infection usually begins near the shoulders, spreading from there to any other part of the body. Without treatment, the affected animal will die.

Itching, rubbing, loss of wool, and the formation of scabs on the skin, together with the fact that the disease spreads rapidly through the flock, should lead anyone to suspect mange. A laboratory examination of skin scraping is to be preferred, but for the sake of speed in recognition a simple home examination may be very helpful. When this is done the scabby skin must be scraped with the sharp edge of a knife and the scrapings ground as fine as possible, the mass of powdered scrapings placed on a piece of black cloth or paper and examined carefully with a small hand-lens or

results. If the ear becomes reinfected later, the treatment must be repeated. A complete description of the treatment is outlined on page 187.

Sheep mange or scab

Scab or scabies in sheep might as well be called mange. It is caused by a small insect-like parasite, of which there are four distinct varieties corresponding to the four types affecting cattle. The four varieties are termed psoroptic, sarcoptic, chorioptic, and demodectic mites, each one favoring a different part of the sheep's body for its operations. Fortunately only one of the four varieties is of great importance and even this one is not nearly as widely distributed as formerly. This reduction in prevalence has been due to the efforts of both state and federal governments, by way of education and quarantine of infected flocks.

Psoroptic or common scab is contagious. The same is true of the other kinds of mites. This is the most common and dangerous type of mange, because it spreads rapidly through a flock by direct contact of the sick with the well. Scab is never inherited, although young lambs frequently become infected from their mothers.

If scab is not recognized early and steps taken to eradicate it, there is likely to be considerable financial loss both in the reduced quality of the wool and the death of large numbers of sheep. Scab is easily cured by appropriate dipping methods and it is only when the disease is ignored or mishandled that severe losses occur. If the flock owner tries to avoid the labor attendant on dipping or other treatment by using some patent medicine mixed in the feed or water, valuable time is lost and the disease may ruin the flock before sane treatment is begun.

Psoroptic or common scab

The common or psoroptic scab mite is very small, usually about 1/40 inch long. When deep scrapings are made from the diseased skin, the mites may be seen with the naked eye

magnifying glass. If the paper or cloth is placed in warm sunshine or heated slightly on the back of a stove, the mites become more active and are more easily seen as they move. The mites are very small and are seen as tiny moving white or gray specks. To clinch the diagnosis, the scraping may be placed in an envelope and sent to the agricultural college for examination.

Many fake remedies are offered to cure mange. They are usually sold as mixtures containing sulfur and are frequently called medicated salt. All are worthless for curing or preventing mange.

Hand applications of various dip liquids are not satisfactory and should never be attempted except during the winter when complete dipping is inadvisable. Hand treatment may give temporary relief in emergencies but should not be depended on as routine.

Dipping sheep in specially prepared solutions is the best and surest method known to cure mange. The solutions most often used are the lime-sulfur and the nicotine dips. Both may be prepared at home. The method is described under the treatment of cattle mange. It is easier and cheaper to purchase the solutions already prepared and ready for use after proper dilution. The druggist probably does not carry these in stock, but he can easily secure them. One should always follow the directions of the manufacturer and the treatment will be successful. Two dippings ten to fourteen days apart are required to cure common mange, the second application killing the mites that hatch from nits left after the first treatment was applied.

When badly infected animals are to be treated, the scabs should be softened by soaking with warm water before they are placed in the dip solution.

Sarcoptic or head-mange

Sarcoptic or head-mange is not common in the United States. This is similar to the sarcoptic mite of other animals in that it burrows under the skin. The disease pro-

duced is called head-scab because this is the favorite place to feed, especially on the skin where the hair is short.

Sarcoptic mange may be distinguished from common scab because it does not have the same tendency to spread over the body, being usually localized about the head.

The method of treatment is the same as for common scab, but the disease is much more difficult to eradicate because of the digging habits of the mite. As a rule, several treatments are required to effect a cure. Fortunately for the sheepmen of America, this type of mange is not often encountered.

Chorioptic or foot-scab

The chorioptic mite looks very much like the others of this group and is about the same size, 1/40 inch long. These mites live on the surface of the skin of the lower parts of the legs, but may extend up as high as the thigh and udder.

The location of the mite and the fact that it rarely spreads into the woolly parts of the animal will serve to distinguish it from the other mites. The disease produced by this mite is essentially the same as other types of mange.

The same methods of treatment apply to this mite. In cold weather hand treatments may be used, or instead the animals may be driven through a wading tank or trough filled with either the lime-sulfur or nicotine dips. The sheep should not be totally immersed in cold weather.

Demodectic or follicular mange

This form of mange is termed follicular because the mite lives in the follicles about the roots of the hair and in the sweat-glands of the skin. Sheep do not have this form of mange very commonly, but outbreaks have occurred in herds of milk goats.

The demodectic mange mites cannot be seen with the naked eye. They burrow into the skin in much the same way as the sarcoptic mite, causing inflammation, swelling, and the formation of pimples that often contain pus. The

hair usually does not fall out at first and these tiny pus-filled pimples are not noticed unless the skin is examined with the hands. When the pus is squeezed out of one of the pustules and examined under the microscope, numerous mites may be seen. From this it will be recognized that deep scrapings are necessary for a successful laboratory test. If the skin is scraped lightly, no mites will be found.

There is no successful treatment that can be depended on to penetrate into the glands and follicles and destroy the mites. It is hoped on this account that the disease will never become very common. Dogs have a similar variety of mange which is extremely difficult to treat and in many cases the destruction of the dog is advisable when large areas of the skin are affected.

Prevention of all kinds of scab

If sheep are on open pasture at the time of treatment, it will be best to avoid this infected field for a month or two. The buildings where the sheep were housed should be thoroughly cleaned and disinfected with ordinary sheep dip, all the litter removed and burned and the flock kept away from the other bedding spots.

Newly-purchased sheep should be carefully examined before they are added to the home flock and an added precaution would be to quarantine them for at least two weeks for a period of observation.

Sheep maggots

Maggots are merely a stage in the life of one of the common blow-flies. The flies that attack sheep are the same as those that cause maggots in cattle. A complete description of these flies and their habits is given in Part I. Maggot infestation of sheep is prevalent in the Southwest, but is not uncommon in the North. Contrary to general belief, maggot infection is a serious problem and many animals die each year from this cause. The blow-fly responsible for this trouble closely resembles the house-fly.

How the maggots reach the sheep

The blow- or maggot-fly deposits its eggs in open festering wounds such as often result after castration, or docking, and in wet or dirty wool. Any open wound that can be reached by the flies may become infected with the eggs. Sometimes the wool becomes soiled with urine, manure or blood from cuts after shearing operations. The open places in the skin become infected with pus-forming germs and this, together with any foul odor about the wound, attracts the flies. Cleanliness is the arch enemy of all flies, because they seek only filthy places to deposit their eggs.

The eggs deposited in the wounds hatch very rapidly and develop into what are commonly called screw-worm maggots on account of their spiral markings. This peculiar shape probably enables them to wriggle their way into the flesh or matted wool. The front end of the maggot is provided with hooks to aid in digging its way into the flesh.

Many of the maggots eventually drop from the wound or infected wool to the ground where they make another quick change and turn into flies ready to infect other animals. It is well to remember that it is the maggot stage of the fly that injures the sheep. The adult fly acts as the means through which the eggs are placed in the wounds. The maggots irritate the wounds and cause the animals so much discomfort that they continually try to rub or bite the infected places.

Treatment and prevention

Infested wounds or patches of wool may be treated with chloroform or any of the coal-tar sheep dips. This kills the maggots, after which they should be washed or picked out from the wound. To prevent further infection after the animals are treated, smear pine-tar over the wound.

The more numerous the flies, the greater is chance for the disease to occur. Blow-flies breed in decaying matter and an unburied animal is ideal for the development of these flies.

After all operations on sheep during fly time, the wounds should be covered over with pine-tar. The covering of tar will hasten natural healing and, in addition, will keep the flies away.

INTERNAL PARASITES OF SHEEP

Grub-in-the-head

Grub-in-the-head is a disease of sheep caused by a fly whose habits are identical with that of the bot-fly of other animals. Grub-in-the-head may be encountered wherever sheep are raised, but is more frequent in the South. Grubs seldom kill sheep but annoy them and keep them poor. To understand how the disease begins, it will be necessary to learn the habits of the fly causing this disease.

Life and habits of the sheep bot-fly

The full-grown bot-fly looks like the ordinary house-fly and is very widely distributed over the United States. These flies, like all others, are more active in June and July, when they attack sheep and deposit tiny grubs or larvæ on the edges of the nostrils. When the flies are plentiful, the sheep may be observed to run wildly about the pasture trying to escape. The only object this fly has in life is to deposit these grubs on the margin of a sheep's nose. When this is done, the fly very soon dies. As the sheep run, they keep their noses close to the ground and shake their heads to and fro, seeking to dislodge any fly that succeeds in making a contact. Like horses, sheep often crowd together with their noses under one another for protection.

Soon after the little grubs are fixed to the skin they crawl into the nostrils and into the cavities or sinuses of the head. This occurs in the summer. The grubs spend the winter inside the head and develop further until they are nearly an inch in length. In the spring, about shearing time, the grubs are ready to move on again and begin their return trip from the head, and by crawling and wriggling from their winter

quarters, they proceed down the nose until they are thrown out when the sheep sneezes. They fall to the ground, dig into the soil, and after a few weeks their development is completed and they emerge as full fledged flies ready to repeat the entire performance.

Actions of sheep infested with grubs

The sheepman commonly calls this disease "snotty nose" and, while inelegant, it is very descriptive. As the grubs crawl either up or down the passages of the nose, an irritation or tickling sensation results which causes a watery discharge. This later becomes thicker and charged with pus. The animal sneezes frequently and carries its head low to the ground. It may even attempt to dislodge the grubs by shaking the head from side to side.

The distraction caused by the pain and difficult breathing interferes with the normal feeding habits of the animal with resulting loss in flesh. In severe cases death follows a period of muscular weakness and convulsions.

Treatment and prevention

No successful treatment has ever been devised. Fumigation and surgical operations on the head have been advocated, but as a rule a badly infested sheep is best slaughtered before it becomes too thin to be of any value.

During the summer months, especially in June and July when the flies are most active, sheep may be protected effectively by smearing pine-tar around the edges of the nostrils. This method of hand treatment will not be very practical except when the number of sheep to be treated is very small. It will do for the first time, but after that the animals should tar their own noses.

Self-treatment by the sheep is effective. Secure a plank about 6 inches thick and of any desired length. Fill the plank with holes bored about 5 inches deep and 2 inches in diameter. Put about 2 inches of salt in the bottom of each hole and smear tar thickly about the top rim of every

hole. As the sheep eat the salt, they will automatically tar their noses. Both tar and salt will need frequent renewal.

As a further help to the animals in their fight against the flies, it is good practice to provide a simple straw-covered shelter in the pasture with the interior as dark as possible, because the flies will not follow the sheep into a dark or dimly lighted place. They like best to work in midday when the sun is bright and warm.

Stomach-worms

Sheep have four stomachs, the fourth or last one being called the true stomach and it is here that stomach-worms live. The disease caused by a heavy infestation of these worms is one of the most serious obstacles to sheep-raising, especially on diversified farms where real pasture rotation is seldom practiced. The annual losses are tremendous, some flocks being almost entirely wiped out. Stomach-worms are found everywhere, but are very prevalent in the Middle West and South. Range sheep do not suffer as much because flocks rarely stay in one place very long.

The adult worms live in the fourth or last stomach. The females lay enormous numbers of eggs and these pass from the infected animal in the manure. They hatch in a few hours after they reach the ground, if moisture and warmth are provided. When weather conditions are unfavorable the eggs may lay dormant for many weeks and are able to withstand considerable cold and long periods of drying. When hatched the young worms or larvæ attach themselves to blades of grass and remain there until they are swallowed by grazing sheep. From the mouth the larvæ or young worms are carried into the fourth stomach and here develop into full-grown worms ready to produce eggs in about one month.

The mature stomach-worm ranges from 1 to 1¼ inches in length. It is a blood-sucker and its color depends largely on whether it is filled with blood. The color will range from white to dark red.

Symptoms of stomach-worm disease

At first the sheep appear dull, listless or droopy. The appetite is variable together with considerable loss of flesh. The normally pink skin becomes pale and dry and such animals are often spoken of as paper-skinned. There may or may not be a swelling under the jaws which, when present, is called bottle-jaw. A foul-smelling diarrhea is frequently noticed. The symptoms alone will not enable anyone to make more than a shrewd guess as to the nature of the disease present.

Immediately after the animal has died, the stomach should be removed, opened and, after the contents are emptied, a careful examination made of the inside lining. When worms are present in large numbers, the entire inside surface of the stomach may appear to quiver. This is caused by the wriggling movements of the massed worms. At this time the worms are likely to be thread-like and red in color. The lining of the stomach is highly inflamed or reddened. When making an examination for this disease, it is of greatest importance that the sheep be opened immediately after death. If this is not done, it is sometimes extremely difficult to locate the worms, because they have a tendency to disappear when the carcass begins to decay.

If it is thought advisable to have an examination made before the animal dies, it is possible to determine this disease by a microscopic examination of the manure. A careful laboratory test would show the worm eggs in the manure from the affected sheep. Such examinations are usually made by a veterinarian or at a college of agriculture.

Treatment

Drenches or liquids given by mouth are always best. Powdered drugs in feed or water are of little value. The best treatment for stomach-worms is drenching with a 1-per-cent solution of copper sulfate. This substance is

best and is easy to procure, cheap, and if administered properly does not injure the animals.

The solution is made by dissolving $\frac{1}{4}$ pound of clear blue copper sulfate crystals in 1 pint of boiling water. When the crystals are dissolved, add enough cold water to make 3 gallons in all. This solution should be mixed in

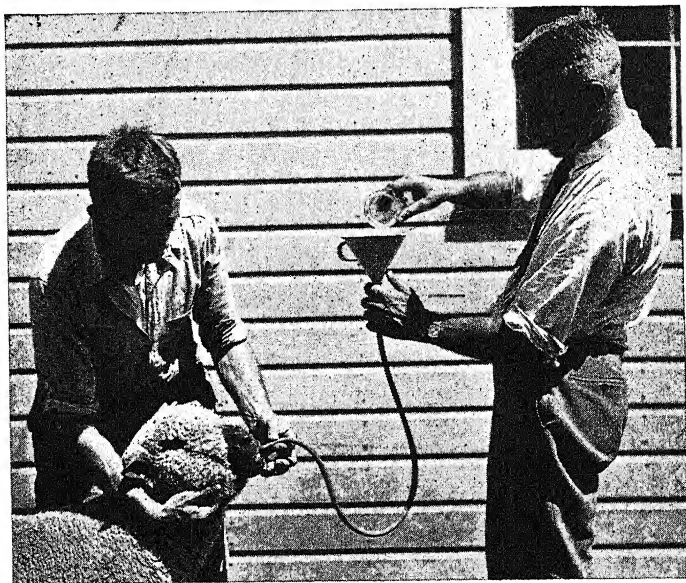


FIG. 13.—Dosing a sheep for stomach-worms. Note apparatus and comfortable position of the animal.

some sort of earthen-ware vessel because the copper sulfate will tarnish metal. Allowing for some waste, this amount of solution will be enough to treat 100 mature sheep. As it is being used, the solution should be stirred to prevent any undissolved particles from settling to the bottom.

Since it is always easier to kill the worms when the stomach is empty, the flock owner should withhold all feed from the animals for ten to twelve hours before they are

to be treated. A dry lot with no hay racks would serve the purpose. When treatment is completed it is best not to give any water for several hours, because this tends to dilute the solution and lessen its effectiveness in the stomach.

Dose

Lambs, three to six months old	1 to 1½ ounces
Lambs, twelve months old	2 to 2½ ounces
Adult sheep	3 to 3½ ounces

Equipment necessary is a 6-foot length of 3/8-inch rubber tubing, one small funnel to fit one end, and a 6-inch piece of 3/8-inch metal piping for the other end.

The metal-tipped dosing end will prevent the sheep from chewing and destroying the rubber end which is placed in the mouth. An assistant catches, holds, and places the iron-tipped end of the hose in the animal's mouth and as the sheep chews on the pipe the owner pours in the proper dose through the



FIG. 14.—Showing how a metal dose syringe should be used. The animal stands naturally. This will prevent choking.

funnel end of the tubing. In the absence of this outfit, the dose may be given from a long-necked bottle or metal dose syringe. Never place the animal on its haunches. Hold the sheep in a natural standing position. There is a tendency to tilt the head of the animal upward. This should be avoided. There is always a good chance of strangling sheep if the head is cramped in any way that will make swallowing awkward (Figs. 13, 14). Give the dose slowly. To hurry may lead to drowning when the liquid passes into

the windpipe. Very young or weak animals should be given about half the customary dose. Strangulation is the chief danger of this treatment, but if the owner is careful to follow these simple directions this may be avoided.

Prevention

Mature sheep may have stomach-worms and still look healthy, but young lambs are very susceptible and die quickly. To protect the lambs against infection from their mothers, a suggested program of prevention would be to dose the adult sheep and change the ewes and lambs to clean pastures every two weeks. The lambs will be removed from each pasture before the eggs which passed from the mothers have time to hatch and crawl up on blades of grass to infect the youngsters.

When contemplating the purchase of sheep from some other farm flock, one should be careful to inquire into the family history of the prospective addition. If they come from a flock which has suffered losses from this or any other disease, it will be best not to buy them. The same precaution in this respect applies to the importation of lice, ticks, mange, sore mouth, necro, and other diseases. One should never buy very thin or scouring sheep, no matter how cheap they are offered.

Pasture rotation alone will not eradicate stomach-worm disease entirely, but this, together with continuous dosing (once each month) with copper sulfate solution should keep the losses down to a minimum. The monthly year-around treatment has given excellent results.

Objections to methods of treatment

There is no easy road to comparative freedom from stomach-worms in a flock of sheep. Any sanitation plan requires hard work and close attention to details. Because it is difficult to follow such a plan, there is always a temptation to buy some well-advertised and guaranteed cure for this disease. The continuous feeding of tobacco dust is

sometimes recommended, but this seldom helps. Mineral mixtures containing nicotine or sulfur are often sold as short-cut methods. They are popular because, according to the directions, the owner need not disturb his present methods of management. They may be easy to use but they are absolutely worthless even to relieve such a disease as this. Guarantees mean nothing unless they are backed up by performance.

Many sheepmen agree that dosing and pasture rotation are logical for the other fellow, but they themselves do not have pastures enough to rotate the young stock every two weeks. If the ideal plan cannot be carried out, one should do the best possible. Knowledge of the facts about how the disease spreads and the reason for rotation every two weeks will help one to make some adjustments according to home conditions. No farm is so cramped that some sort of rotation cannot be practiced.

The small and usually closely confined farm flock suffers from stomach-worms more than sheep on the open range, because the latter are on the move almost continually and do not stay in any one place very long. This amounts to daily rotation. The farm flock that has an opportunity to graze along roadsides or ditch banks is safer than one on a permanent pasture.

The owner of an infested flock must either plan a regular system for rotating pastures or retire from the sheep business, because there is no cure-all for the parasitic diseases of sheep. Many are advertised but none is satisfactory, not even the old standby, copper sulfate, unless it is used intelligently.

Stomach-worms are widespread and a real menace to the sheep industry, and unless the disease is recognized, great financial loss and discouragement always follows in its trail.

Tape-worms

The tape-worms comprise another group of intestinal worms that infest sheep. The owner of an infested flock is

likely to take this disease more seriously because the worms are large and easily seen when passed out in the manure. Some of the varieties may reach several yards in length and do not leave anything to the imagination. While tape-worms may be found anywhere in the United States, they do not occur with great frequency and do not constitute as serious a menace as the stomach-worms. This is fortunate since little or nothing is known of their exact life history or habits. This is not true of all the tape-worms of other live-stock, for the life history of some of them is well understood. To escape any disease it is usually necessary to know the weak points of its defense and then devise preventive methods accordingly. Until a full knowledge of sheep tape-worms is secured, preventive methods will be obscure.

There are several varieties of tape-worms but only two need be discussed at this time. The first and most widely distributed has no common or trade name and its technical name will have to be used. It is called *Monezia expansa*, the last part of the name indicating its great length. This is by far the largest, longest, and commonest tape-worm of sheep. Except in certain sections, it will be the one usually encountered.

The second to be described is usually called the fringed tape-worm and appears to favor range conditions for its development. Eastern and middle western farm flocks are seldom affected by this type. The fringed tape-worm is rarely over a foot long.

Monezia expansa (tape-worm)

This worm is yellowish-white in color and may be 15 to 30 feet long and $\frac{3}{4}$ inch in width. The worm tapers toward the head, which is pear-like in shape and equipped with suckers. The entire length of the worm is made up of segments or links which are broader than long. Every one of these segments has a complete reproductive system and produces eggs. The worm attaches itself to the inside wall of

the small intestines and grows from the head out, so that if several feet of a 15-foot tapeworm break off and pass out in the manure, that part of the worm remaining inside of the animal continues to grow again by adding more

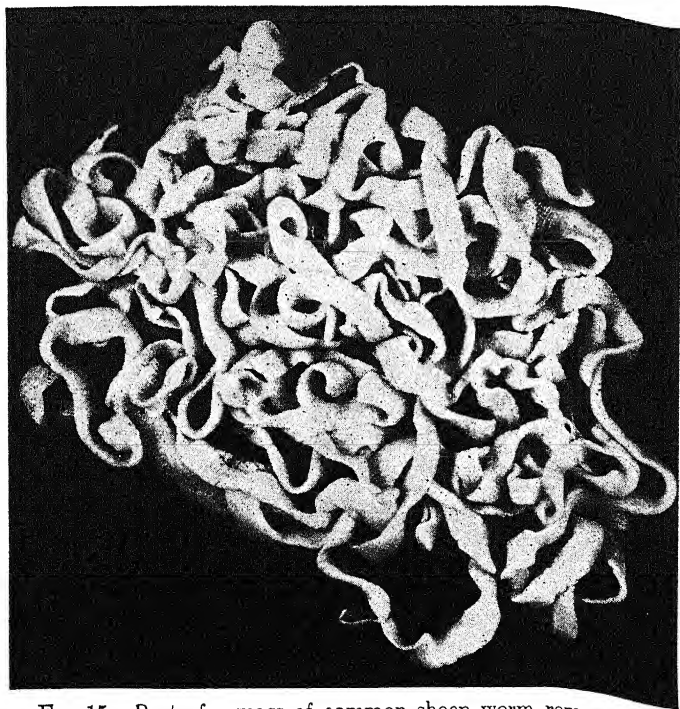


FIG. 15.—Part of a mass of common sheep worm removed from one lamb.

segments until it regains its former length. This tapeworm lives chiefly in the small intestines of sheep (Fig. 15).

Only a small and relatively unimportant part of the life history is known. The adult worm lives in the small intestines and produces eggs which pass out in the manure.

From here the supposition is that the eggs are taken in by some other form of animal life, in which further developments take place until by some means the young worms or larvæ again reach a susceptible sheep. This stage is a blank.

It is well known that part of the life history of one of the dog tape-worms is spent inside of sheep in the form of bladder-like cysts which contain a watery fluid and young worms. When found attached to the liver or intestines of sheep, they are called bladder-worms. The cyst is usually about 1 inch in diameter. Each bladder contains the head parts of a dog tape-worm. The mature stage of the tape-worm is spent in the intestines of a dog. The bladder episode in their life is merely one phase of their existence. Here they remain until they are swallowed by a dog when the animal has an opportunity to eat or chew the entrails of sheep. From then on they complete their development inside the intestines of the dog. Probably the sheep tape-worms have a similar life history, but this remains unknown at this time.

Tape-worms favor young sheep and lambs, but older animals are commonly infested. It would be almost impossible to recognize tape-worm disease from the symptoms alone, because infection by any of the intestinal worms causes unthriftiness, delayed development, weakness, diarrhea, and death if the worms are numerous. Portions of the worms may have been seen in the manure or hanging from the rectum. If this means of diagnosis is not available, it is suggested that a microscopic examination be made of the manure or feces. The presence of tape-worm eggs would be helpful in making a diagnosis. Tape-worms have a distinctive type of egg which can be identified under the microscope.

It would be better to destroy one of the sick sheep and make a thorough examination of the small intestines. With a sharp pair of scissors, open the intestines from end to end and look for the worms. They are big enough to be seen

readily. This method is much more satisfactory than guessing.

Several methods have been used to rid sheep of tape-worms, but none is entirely successful (Fig. 16). Tape-worms are difficult to expel by ordinary methods. One treatment often recommended is oleoresin of male fern, administered in one dram doses. Each dose is mixed with 2 or 3 ounces of castor oil.

Copper sulfate solution, as used in the treatment of stomach-worm disease, is also suggested. The Oklahoma Experiment Station has modified this method by adding to the solution 1 per cent, by weight, of powdered tobacco. The tobacco dust is steeped over night and the 1-per-cent copper sulfate solution is then added to it. Lambs receive $1\frac{1}{2}$ ounces and older sheep twice as much. Any of these treatments may be tried, but they are not considered effective.

The complete life history of this tape-worm being unknown, no preventive methods are advised other than careful sanitation. It is probable that regular rotation of pastures would be of considerable value in keeping the young lambs free from this disease.

The fringed tape-worm

The fringed tape-worm is so called because it has a fringe on the lower border of each segment or link. If



FIG. 16.—Dosing a sheep with a long-necked bottle.

the worm is placed in a pail of clear water, the fringe may be observed floating out from each segment. This reproduces like all other tape-worms, each segment having a complete reproductive system.

The fringed tape-worm is yellowish or dirty-white in color and its head has sucking mouth-parts. This worm is much shorter than *Monezia expansa*, being only 5 to 12 inches in length and $\frac{3}{8}$ inch in width. *Monezia expansa* lives only in the small intestines while this fringed worm lives in the intestines and liver. When a short tape-worm is found in or near the liver, it is probably this type.

The fringed tape-worm occurs most often in range sheep. It appears in Minnesota, North and South Dakota, Nebraska, Arkansas, Oklahoma, and all states farther west. The long tape-worm is rare in these sections.

These worms also, no doubt, have an intermediate stage which takes place in some other animal, but this fact is not known. Infection may take place when the larvæ are swallowed by grazing sheep. Just what becomes of the eggs after they pass out in the manure of an infested sheep until they are ready to be taken into the body of another animal as a young tape-worm has not been discovered.

Infection probably takes place when the animals are on grass pasture. The young worms or larvæ may be attached to blades of grass. Some time after infestation the sheep become unthrifty, thin, pale in the normally pink parts of the skin, and usually have diarrhea. If a number of the worms crawl from the intestines into the liver, they may clog the gall-bladder and bile-ducts. The disease now becomes very serious and the affected animal almost always dies.

To recognize this disease, look for broken-off sections or segments of the worm in the manure. When they are found, they should be placed in clean water and the fringe noted as it floats away from the bottom edge of each segment.

When a sheep is opened after death, the inside of the small intestine should be carefully examined. Keep a sharp look-

out for tangled masses of the worms, for they are sometimes present in great numbers. Remove the liver from the carcass and slice it to discover any worms that may have strayed away from the intestines. Open the gall-bladder, the canals leading from the gall-bladder into the liver, and the duct or vessel leading into the pancreas. If a sheep is suffering from this tape-worm, the parasites are easy to find in either the intestines or liver.

There is no generally accepted or successful treatment. Until the complete life cycle or history is discovered this may be impossible. The 1-per-cent solution of copper sulfate given in the same doses as recommended for stomach-worms may be tried.

The lack of full information concerning the habits of this worm makes it very difficult to recommend even reasonably safe preventive methods. Care in the purchase of new stock and the selection of new range would no doubt aid in keeping down the disease.

Lung-worm disease

The worm causing this disease is white, thread-like, and from 1 to 4 inches in length. When the worm is examined closely with a hand-lens, it shows a dark pin stripe throughout its entire length. While lung-worm disease cannot be classed as very common in sheep, the worms are widely distributed over the United States and cause greatest losses in the South.

Life history of the lung-worm

Here again is another very interesting life history of a worm. The adult male and female worms live in the air passages of the lungs and are big enough to be seen easily when the lungs are opened and sliced into sections. The female or mother worm lays numerous eggs. When the eggs leave the female they hatch in the lung of the sheep and are later coughed up into the mouth.

It is interesting to note that these little worms are not

able to infect another healthy sheep at this time. Coughed up mucous containing the tiny worms has been placed in the lungs of healthy sheep with no bad effects. These tiny worms are not fully developed and must pass through other stages before they become dangerous to other sheep.

When the newly hatched worms are coughed into the mouth, they may either pass directly to the ground or be swallowed and leave the sheep in its manure. Whichever route is taken, the small worms eventually reach the ground and, if the weather is warm and there is sufficient moisture, they pass through two molting stages after which they are able to stand unfavorable weather conditions, such as drying and freezing, until they have an opportunity to find their way back into another sheep. These two molting stages require about ten days for completion. The little worms are now dangerous to other sheep and their life work is begun in earnest. The young worms crawl up on blades of grass and lie waiting for grazing sheep to eat the grass. After the infected grass is taken into the mouth, the worms resume their journey into the lungs. Just how the worms make their way into the lungs from the mouth is not known. In a month or more the worms reach maturity and they also send out batches of their offspring to start on another round trip, *via* the mouth, grass, mouth, and back again into the lungs.

Symptoms

As in all other cases of worm infestation, the affected sheep become unthrifty, thin, and run-down in appearance. There is, however, a variation in this disease, because the infested animal furnishes an additional hint in the form of coughing. The worms irritate the air passages in the lungs, setting up an inflammation which may cause a nasal discharge. If there is a large number of worms in the lungs, pneumonia accompanied by rapid and difficult breathing may be recognized. Diarrhea is almost always present. The apparent loss in condition, coughing and general weak-

ness might make one suspicious of lung-worm disease, but a positive diagnosis is impossible without a post-mortem examination. A microscopical examination of the mucous from the nose might be attempted in search of the tiny immature worms.

If a veterinarian is available, he may make a search for worms in the coughed-up material from the lungs. Better still would be the post-mortem examination of one of the suspected sheep. When the dead animal is opened, the lungs should be removed and sliced in sections, looking for signs of white thread-like worms. They are easy to see and often take on the appearance of tangled masses of thread, almost entirely blocking the air passages. Finding the worms in the lungs will verify the diagnosis.

Treatment and prevention

There is no successful treatment for lung-worms. Inhalations of gases and injections of gasoline and chloroform have been tried, but they are not effective, and too many sheep are likely to be killed outright from the treatment. The use of drugs in the food or water is worthless.

To prevent lung-worms, keep the flock on high and dry pastures. Low-lying wet fields favor the development of the young worms. Practice pasture rotation as often as possible and place the badly infected sheep by themselves, as they continue to infect a pasture, making it dangerous to the younger animals. See that the water supply is clean and strive to build up the general strength of the flock by good feeding methods. The program of prevention consists of high dry pastures, rotated as often as possible, together with isolation of badly infected animals.

Nodular disease

Nodular disease of sheep is so called because of the round wart-like growths or nodules in the wall of both large and small intestines. Most farmers and others who have slaughtered sheep for home use have observed and perhaps

wondered what they were. The packing house owner objects to them because they injure the intestines in such a way as to make them unfit for use as sausage casings. The nodules are often mistaken for tuberculosis by the inexperienced person. Tuberculosis in sheep is extremely rare.

Evidence of nodular disease may be found wherever sheep are raised. Few animals die but heavy infestation no doubt interferes with the normal growth of the animal.

Cause of nodules

The nodules on the outside surface of the intestines are merely a stage in the development of another intestinal parasite called the nodular worm. The adult lives inside the intestines and is not credited with being the cause of great losses.

The life history of the nodular worm is thought to be simple and direct, although certain details are lacking. The adult female in the intestines lays eggs which are passed out with the manure. Pending favorable weather conditions, the eggs hatch and after a time are swallowed by grazing sheep. There is a blank space here in the life history. The worm is next found imbedded in the little round warts on the sides of the intestines. This accounts for the name of the disease. Just how the little worms reached this stage and how long they stay is not definitely known. When the lumps are cut with a knife, they contain a cheesy green substance. At some later date, the worm developing inside the warts breaks through into the intestines and grows into a mature worm. After a few weeks it reaches its adult stage and repeats the process of egg-laying.

Symptoms of nodular disease

Many sheep are infested with both the nodules and the mature worms without appearing unhealthy. This refers, of course, to mild infestations only. When large numbers of nodules and worms are present, sheep may be expected to show the usual signs of worms, namely gradual

weakness and loss of flesh. This is not sufficient evidence to make sure of this disease. A post-mortem examination will show the nodules on the intestines and establish the diagnosis. The adult worms probably will be overlooked because they are very small, being about $\frac{5}{8}$ inch in length.

Treatment and prevention

Nothing can be done to remove the nodules or kill the young worms living in them. Inasmuch as most of the harm done by these worms is due to the warty stage on the intestines, little progress has been made in treatment to get rid of the adult worm in the intestines. This is because the nodular stage is the damaging part of the life history and even though the adult worms could be expelled from the intestines, the nodules would occur as long as the pastures were infested with young worms.

As prevention, keep sheep away from wet pastures. Dry-lot feeding of the flock may be tried. This means close confinement on a bare and uninfested corral. The animals are fed from racks and the drinking water is protected from contamination by the manure of infested ewes. The young lambs and sheep are especially susceptible. Under usual farm conditions, the farmer does not consider this disease worthy of any great effort at control, since sheep seldom die. No doubt many thin and unprofitable sheep suffer from nodular disease and do not return much, if any, profit to the owner.

Liver-flukes

The disease caused by liver-flukes, while by no means uncommon, is not general in all sections of the United States, most of the infection being noticed in the Atlantic, Pacific, and Gulf states. Scattering cases have been reported in many other parts of the country. Generally most sheepmen will be unfamiliar with this disease.

Since one stage of the development of flukes takes place in small snails, low wet land favorable to the growth of

snails would naturally be the place where liver-fluke disease would be most likely to occur. In the range states, the large bands of sheep graze mostly on high dry land and consequently this disease is very rare in such sections.

In England, with its damp lowlands, the disease was formerly responsible for great annual losses. Nothing could be done to fight the disease until the life history was discovered. When this was recognized, efforts were made to drain the lowlands where snails and flukes abounded. This, together with pasture rotation, has placed this disease under control in that country. This is another illustration of the importance of knowing the life and habits of the parasite. Before the snail was found to be a factor in the life of flukes, no progress could be made.

In the United States two varieties of flukes affect sheep, the common and the large liver-fluke. Both have the same life history and habits.

Life history of the liver-fluke

The full-grown common fluke is about 1 inch long, flat, brown, very thin, and leaf-shaped. The large liver-fluke is very similar but is much larger, sometimes reaching 4 inches in length. Both varieties of mature flukes are found chiefly in the liver, bile-ducts, stomach, intestines, and lungs. While wandering flukes may be present in various parts of the body, the liver is the home of the adult.

Each mature fluke is both male and female, the male opening being only a short distance from the female. The eggs are produced, leave the uterus of the fluke, and pass out of the liver by way of the bile-ducts into the intestines. From here they are carried to the ground in the manure. It has been estimated that one fluke is able to produce over 100,000 eggs. When the eggs pass from the intestines on to the ground, many of them reach water in which they undergo a change and develop into another stage called the free swimming. They now swim about in puddles until they

find a snail. If they do not locate a snail, they die after a few hours. Unfortunately, many snails are usually present and the young flukes have little trouble finding one to attack. The tiny flukes enter the snail's body, spend some time there, and later escape to swim again in water until they are able to attach themselves to a convenient blade of grass. They are now ready to be swallowed by grazing sheep. When the little flukes are attached to blades of grass, they resemble white specks about the size of a pin-head. If they are not swallowed in a reasonable length of time, they dry up and die. This is called the cystic stage of the fluke's life.

When the cysts are eaten by sheep they pass into the stomach and intestines, the shell-like covering falls off, and the young flukes begin their adult life. They now proceed to the bile-ducts by several different routes, work their way into the liver, and begin to lay eggs. When the egg-laying season is completed they pass back into the intestines, shrivel, and die.

Symptoms

The early stages of this disease usually pass unnoticed. If the animal harbors only a few flukes there may be no outward signs; in fact, the sheep may appear in excellent condition. In such cases the flukes are recognized only when the animal is slaughtered either at home or in the packing house.

While sheep may become infested any time during the summer months, it is probable that most of them eat the fluke-infested grasses in the late summer and early fall. The usual symptoms of ordinary worm infestation are noticed, such as dullness, loss of appetite, gradual weakness, and sometimes swellings under the throat and on the abdomen. These symptoms occur during the winter months and, as each one becomes more evident, the animal becomes thinner and a diarrhea appears. It will be seen that a positive diagnosis from the symptoms alone is out of the

question. Most of the affected sheep become progressively weaker and finally die of exhaustion.

If the losses occur in a section where the disease is known to exist, the diagnosis is much easier because of the natural suspicion. In the live sick animals a microscopic examination of the manure will often reveal the fluke eggs, but for practical purposes a post-mortem examination of the carcass is best. Kill a sick sheep and open the carcass. Remove and carefully examine the liver. Slice it in thin sections and keep a sharp watch for the leaf-like flukes. They are easily seen in the ducts of the liver. If watched intently they will be seen to move. One farmer reported them as prune skins. The finding of the mature flukes in the liver will identify the disease positively.

Treatment

Liver-fluke disease is very difficult to treat. Oleoresin of male fern is often recommended in doses of $\frac{3}{4}$ to $1\frac{3}{4}$ teaspoonsful, depending on the size of the sheep. Each dose is mixed with about $2\frac{1}{2}$ teaspoonsful of mineral oil and administered in the morning two or three hours before the animals are fed. Repeat the treatment every morning for three or four days.

Carbon tetrachloride in one-cubic-centimeter doses administered in capsule form is also suggested. The dose is given in the morning with no period of fasting. It is reported to be very efficient. Both of the treatments mentioned should be given by a competent veterinarian.

Control of liver-fluke disease

As soon as the disease is identified on a farm, all the animals thought to be infected should be butchered before they become a total loss. The badly infected ones should be destroyed and burned.

The manure from the infected flock should never be placed on low wet land. It is better not to use it at all, because it always contains innumerable fluke eggs.

Whenever treatment is attempted, it is best in the late fall or early winter months. This will be at a time when the animals will have acquired all the infection possible for that season.

All pastures known to be infected should be fenced off, drained, and treated with a heavy application of lime or salt to destroy the snails and young flukes.

If it is impossible to keep the flock off such dangerous pastures, it is suggested that each sheep be given two drams of salt daily mixed with its feed. If this cannot be done, the drinking water may be treated to contain $\frac{1}{2}$ of 1 per cent of salt. This will tend to kill the young flukes as they are swallowed each day.

If possible, only high and dry pastures should be used, because snails do not thrive on dry soil. Early recognition of the disease and prompt preventive measures will keep the flock comparatively free.

Gid or turnsick

Gid is a disease affecting the brain and spinal cord of sheep. The disturbance is caused by the presence of the larvæ of the dog tape-worm in the brain and spinal cord of sheep. The full-grown dog tape-worm does not bother sheep.

Gid is a common disease in Europe and many other countries. In the United States it is found chiefly in Montana, but occasional outbreaks have been reported in other states. It is not a common parasite of sheep but may become more so. In order to understand the nature of this disease it will be necessary to study the life history of the dog tape-worm.

Life history of the dog tape-worm

The adult tape-worm of the dog lives in its intestines. The tape-worm eggs pass out in the manure or feces, fall to the ground, and under favorable weather conditions develop partially inside their shell. The sheep swallows the

half-hatched eggs and they are carried into the stomach and intestines where hatching is completed. The newly hatched larvæ or young worms are provided with hooks, by which they bore into the sides of the intestinal wall and enter the blood-vessels. From there they are transported to various parts of the body. Only those that reach the brain or spinal cord of sheep are able to live and develop further. The remainder die.

When the larvæ reach the brain or spinal cord, they settle down to stay for several months. During this time a cyst or small bladder-like sac, filled with a watery liquid, forms about the young worms. This is called the bladder-worm stage. When one of the bladders is examined at this period of their growth, it is found to contain many small white objects about the size of a grain of wheat. These white seed-like bodies seen floating in the watery fluid are dog tape-worm heads. It is this stage in the life of the worm that injures sheep. The brain of a sheep may contain as many as five or six of these cysts or bladders.

When an infected sheep is killed, sometimes dogs have access to the carcass and when they eat and swallow the bladder-like cysts, the tape-worm heads are liberated in the intestines of the dog, where they complete their growth. In the dog this tape-worm sometimes reaches 2 or 3 feet in length.

Symptoms of gid in sheep

It should be kept in mind that the term gid always refers to the larval stage of the dog tape-worm as it occurs in the brain of sheep. The symptoms shown in the early weeks of the disease are often overlooked and it is not until the animal begins to develop pronounced symptoms that trouble is suspected. At one stage of the disease the animal walks in circles or becomes "turnsick" as the expression goes.

The first noticeable symptom occurs several months after the sheep becomes infected. The sick sheep walks with its head and feet held high and may stumble and appear to

lose its sense of direction. There is gradual loss of appetite and flesh, together with dullness, staggering and falling. The tendency to walk in circles is a final stage of the disease. The animal often dies in convulsions three to six weeks after the first symptom appears.

The symptoms may be helpful in forming an opinion but a post-mortem examination of the carcass is necessary to make certain diagnosis.

The animal suspected of having this disease should be killed, the skull opened and the brain carefully examined, looking for the bladder-like cysts sometimes as large as a hen's egg. The watery fluid found in the cyst will contain many white floating specks or worm heads.

Treatment

A surgical operation for the removal of the bladders or cysts has been performed. The spot in the brain where the cysts are located is usually found under soft spots in the skull. These may be recognized because the animal flinches when the soft spot or spots are touched with the fingers. A hole is drilled in the skull over the affected part of the brain and the cysts drained. The operation is not generally successful and seldom attempted. There is no other treatment, most of the affected sheep dying a few weeks after the symptoms become evident.

As prevention, kill all giddy sheep as soon as the disease can be recognized. Destroy the heads of the animals, so that dogs may not infect themselves with tape-worms and thus spread more eggs in the lots and pastures. Keep sheep dogs free from tape-worm because they are the real cause of the disease in sheep. All farm dogs that tend sheep should be given $\frac{1}{4}$ teaspoonful or 1 dram of oleoresin of male fern. This should be given in capsule form and followed immediately by 1 ounce of castor oil. Treat all the dogs three or four times a year. If all the dogs on the farm or ranch were freed and kept free from tape-worm this disease in sheep would eventually die out.

CHAPTER XIII

BREEDING AND LAMBING TIME

THIS chapter is devoted exclusively to a discussion of the problems that often confront the farmer during the breeding and lambing seasons. Since the breeding season precedes lambing by about five months, a short account of the proper management of the ram and ewes at that time may be of value.

THE RAM

The ram or rams heading the flock should be pure-bred, active, and from one to three years of age. A well-grown and vigorous ram lamb should not be held responsible to more than ten or fifteen ewes, because more than this number may injure him for future usefulness. A strong yearling ram will often serve from fifteen to thirty ewes while the older rams will handle from forty to sixty ewes. The number of ewes assigned to each ram will depend on his physical condition and ruggedness.

When the breeding season is at hand, the ram should be in excellent condition. To secure this necessary vigor he should be fed carefully for about a month before he is used for service. If the summer pasture has been good, he may be given about a pound of oats daily in addition to the regular legume roughage. If he is thin and run-down, a more generous and tasty mixture may be given. Such a mixture may be composed of five parts corn, ten parts oats, three parts bran and two parts linseed-meal by weight. A pound or two of this fed daily together with all the alfalfa or sweet clover he will clean up should make the animal fit.

The exact date for placing the ram with the breeding ewes

will be governed by the time the lambs are desired. Lambing may take place any time from February until June. If the owner of the flock cannot provide warm quarters for the ewes and lambs, it will be far better to have the lambs arrive from March fifteenth to May first. To determine the proper time to turn the ram in with the ewes, the owner may figure back about 145 days from the date the new lamb crop is desired. If the ram is heavily woolled, the surplus clipped from the belly about the penis greatly increases his efficiency in serving the ewes.

The shepherd should make note on a calendar of the date the ram is placed with the ewes. Mistakes are sure to be made if this is left to memory. This written record will aid in having all necessary preparations completed before the ewes begin to lamb. If it is desired to keep a fairly accurate breeding record, a changing color-marking scheme may be used. One tube each of three or four different pigments may be bought at any hardware store, and each color mixed in about a pint of ordinary motor oil. Starting with red, for example, the ram is generously daubed between the front legs. As each ewe is bred, it is automatically marked for easy recognition. More red color may be added as needed. Every two weeks a different colored paint may be applied. Common house paint should never be used for this purpose, as it hardens the wool and lowers its value and may cause lead poisoning if eaten by the sheep. If for some reason the ram is taken away from the flock, he will be more contented if wethers or bred ewes are put in with him for company.

THE EWES

The ewes should be in good flesh and gaining with the advent of the mating season. Ewe lambs do not make good breeders and, as a rule, do not drop strong and vigorous lambs. Young ewes should be bred so they drop their first lamb when they are about two years old.

If perchance the ewes are suffering from any skin disease

such as lice, ticks, or mange, they should be dipped before cold weather.

Reasonably accurate breeding dates can be kept if the ram is marked as just explained and the date recorded when he is turned in with the flock. Ewes come in heat every two or three weeks, the period lasting from one to three days.

It is common practice to resort to flushing the ewes before the breeding season arrives. This means extra feeding to hasten the appearance of heat. It is well known that flushing or conditioning the ewes in this manner will increase the number of twin lambs. Flushing will tend to make all the ewes come in heat in a shorter period and thus make the lambing season of shorter duration. Flushing should be started about three weeks before the ram is turned in with the ewes. The breeding flock may have been on scanty pasture during the season, but as fall and cool weather approaches it should be given better pasturage and fed some grain in addition. About $\frac{1}{2}$ pound of oats daily to a ewe will be sufficient. Pumpkins and other succulent roots may also be fed. Rape and soybeans furnish excellent pasture for flushing.

Before the ram is turned in with the ewes, all the tags and soiled wool should be clipped from about the region of the tail. This makes the act of service surer.

Care of the ewes during pregnancy

The period of pregnancy is about 145 days, with variations. During this time the pregnant ewes should be gaining in flesh. It is desired to keep the ewes in fine condition so they may be able to give birth to strong and healthy lambs. There is always a tendency to allow the ewes to become thin during the winter months. Their real condition is not recognized because of the thickening coat of wool. Unless they are examined by hand, their physical condition may not be apparent.

For early winter feed the ewes may be given alfalfa or

clover hay. Other substitutes, such as straw and corn-stalks, are frequent but they are not as good. Too much silage should not be fed, 2 pounds daily being enough for each animal. If silage is not available, 2 or 3 pounds of turnips, sugar-beets or mangles will provide variety and succulency.

About a month before lambing time, the pregnant ewes may be given about 1 pound of grain each day. This will promote milk secretion and make the ewes stronger in preparation for the ordeal of lambing.

If goiter in the new-born lambs has been observed in previous years, the present lamb crop may be protected by supplying the ewes with iodized salt during the entire period of pregnancy. The iodized salt may be prepared at home by mixing 1 ounce of potassium iodide with 300 pounds of common stock salt. It is sometimes advocated that ewes be given more than this amount of iodine. More will not harm the animals, but the amount mentioned is sufficient to prevent goiter in the lambs.

It is essential that the bred ewes have plenty of exercise, especially during the last few weeks of pregnancy. The feed-racks may be placed at some distance from the shelter to encourage the ewes to exercise by walking to and fro to feed. If this is not practical, the hay may be scattered over a considerable area of ground, so that the animals have to do more or less walking to get their feed. Exercise is the only way to prevent bred-ewe disease or pre-lambing paralysis.

Some farmers put sheep in a class with camels in respect to their consumption of water. Ewes do not relish ice-cold or dirty water, but if a clear and reasonably warm supply is constantly at hand they will drink large quantities.

The breeding ewes should be provided with a comfortable shelter for protection from severe winter weather. The lambing shed should be well bedded with clean dry straw and kept sanitary. Clean and deep litter will do much to prevent such infections as scours and other navel diseases.

LAMBING

Preparations for lambing

If lambing time is the shepherds harvest, it behooves him to receive and care for it properly. The chief necessity for a successful season is a large and healthy crop of lambs. A caretaker should be on hand night and day when the lambs begin to drop. Lambs frequently are born at night and if they are left in a cold shed and not promptly dried they often become chilled and die.

If accurate breeding dates have been kept, the owner may easily figure the approximate time when the first lambs will be dropped. The lambing shed should be in readiness with several pens prepared to receive the ewes about to lamb. Some farmers construct movable lambing pens made of slats and hinged together. These pens are placed in sight of the remainder of the flock, so the confined ewe does not become nervous or lonesome from the strange surroundings. In cold weather the lambing ewe should be protected. While sheepmen like to have the ewes in good flesh when they are about to lamb, there is some danger in too heavy graining. They should be in good condition, but not over-fat.

Another preparatory measure would be to clip the wool from about the udder, so the lambs will have no trouble finding the teats of the mother. The ewes awaiting lambing should not be crowded too closely. It is estimated that each ewe should be allowed about 14 to 20 square feet.

Normal lambing

The early signs of the approaching birth are much the same in ewes as in other farm animals. The usual symptoms are uneasiness, sunken appearance in the region directly in front of the hips, swelling of the vulva, and increased size of the udder. The ewe showing such evidence of lambing should be placed in a lambing pen by herself.

As a general rule, ewes in good physical condition drop

their lambs without any trouble, but the caretaker should be on hand to render assistance if it is necessary.

Ewes, like cows, dry their young by licking the hair of the young animal, but when they neglect to do this the lamb must be dried by hand. Strong lambs will nurse without assistance, but a few weak ones may need help.

Difficult lambing

Sometimes fat ewes fail to lamb normally. If assistance is not given promptly they will die, because ewes cannot withstand a long and exhausting period of labor. Any ewe that strains or labors two or three hours without results should be examined to ascertain whether the lambs are coming in correct form. Twin lambs frequently become twisted in the uterus or womb, making the passage of either lamb impossible. The aid of a veterinarian is always advisable, but usually the owner must apply first aid himself.

The normal or regular position for lambs to come is head and front feet forward, but in some cases this position is reversed. The person who attempts to assist the ewe to lamb should first wash his hands and arms and trim the finger-nails to prevent injury to the ewe and grease the hand and arm with vaseline or olive oil.

If the lamb is partly out of the birth canal but cannot be brought forth, it will be necessary to force it gently back into the womb. The head and feet are then straightened to their normal position and again brought out as far as possible. Loop a coarse string or small rope about the feet and as the ewe strains to expel the lamb, apply traction and pull the rope outward and downward with each labor pain. If twin lambs are tangled in the uterus, expert assistance is always necessary if the ewe's life is to be saved. A ewe in difficulty at lambing time will not stand a long siege of labor and if assistance is given at all it must be supplied before the animal is worn out. Some ewes are very weak after the lambs are born. A

simple home-made stimulant that works as well as most drugs at this time is a pint or more of strong black coffee.

CARING FOR THE NEW-BORN LAMB

After the lamb has been dried either by the ewe or by hand and has begun to nurse, the navel cord should be dipped in a tumbler of pure tincture of iodine to prevent navel infection, stiffness, and swollen joints. These diseases are fully described in Chapter XI.

Weak or chilled lambs

Occasionally a lamb is born weak and some are born during the night when no caretaker is present and become chilled from lack of attention and protection. The weak lamb should be dried at once and its nose and mouth wiped to remove any remaining mucous. If the cord is not broken, it may be cut off a few inches from the body and dipped in iodine. If the lambs breathe with difficulty or not at all, the shepherd may blow into the nose and slap the ribs briskly a few times. When breathing is established, the lamb should be assisted to nurse, after which it usually gains strength rapidly.

Chilled lambs will die unless they are warmed at once. They may be wrapped in a warm blanket and carried to a heated room. Another way to warm the lamb is to dip it in a tub of water as hot as the elbow will stand without flinching. After the warm bath the lamb should be dried and kept wrapped for a few hours. The young animal should be given warm milk from a bottle until it is strong enough to be returned to its mother. The hot-water bath requires preparation and such arrangements should be made in the evening, so that it may be handy when the emergency arises.

Disowned lambs

It sometimes happens that an ewe will refuse to have anything to do with her offspring. This, however, is not

likely to occur if the ewe is allowed to lamb by herself in a private pen designed for this purpose. One way to bring about a reconciliation between mother and lamb is to draw some milk from the udder of the ewe and smear it over her nose and on the rump of the lamb. This frequently establishes ownership.

If such an unnatural mother is placed in a pen with the young lamb and tied so that she cannot chase the youngster away every time it tries to nurse, she may finally accept it as her own.

Orphan lambs

An orphan lamb is sometimes adopted by another ewe that has lost her own lamb or in some cases a ewe with abundance of milk and only one lamb to suckle can be persuaded to accept another. An orphan lamb may often be given to a ewe that has just lost her own lamb. The skin of the dead lamb is removed and fastened over the body of the orphan. The mother recognizes the odor from the skin of her own lamb and frequently will accept the substitute. The skin should be removed from the adopted lamb as soon as the ewe becomes accustomed to it. This is usually in a day or two.

Orphan lambs may be bottle-fed on undiluted cow's milk. For the first day or two it may be given 2 or 3 tablespoonsful of milk every two hours. After the first week it should be increased to 2 ounces of milk three times a day. The milk may be given in an ordinary nursing bottle supplied with the regulation nipple with the hole made larger. The amount of milk fed may be gradually increased until a full pint is taken every eight hours. After a few weeks the lambs will begin to nibble hay and grain.

CARE OF THE EWE AFTER LAMBING

The ewes that have recently lambled should be kept by themselves, fed small quantities of hay and allowed plenty of water for the first few days. Toward the end of a week

the feed may be increased until the ewes receive from 1 to 2 pounds daily of an oat and bran mixture. After the second or third day the ewes may be given small quantities of silage along with the hay and grain. The lambs need plenty of milk and the feeding of grain will tend to keep the ewes in a full flow of milk. One should be careful not to over-feed ewes the first few days after lambing.

LAMBING-TIME DISEASES

Prolapse of the uterus or womb

This is a condition similar to that which occurs in the dairy cow. The violent straining accompanying a difficult birth may cause the ewe to turn the uterus wrong side out. This appears as a raw bleeding mass protruding from the vulva or external genital organ.

Fortunately this trouble is not very common but does occur in some cases. It should be attended to immediately or the ewe will die of infection. The protruding portion of the uterus is washed with warm water to remove any dirt or litter. The operator should wash his hands carefully and gently force the uterus back into place. After it has been replaced it may be advisable to sew the lips of the vulva together with coarse string, otherwise the uterus may be forced out again if the animal continues to strain. The sutures or stitches may be removed after a day or two. If the uterus has been allowed to remain out for a long time, the operation is not likely to be a success. If possible, a good ewe should have the services of a veterinarian. If the accident occurs at such a time when help is not available, the owner will have to do the work himself. Many farmers are not skillful but if the animal is attended to early and sensible sanitation is practiced, the ewe has a fair chance of recovery, providing, of course, she is not near death from exhaustion.

Infection of the uterus

Metritis or inflammation of the womb is occasional. It may be caused by dirty hands or instruments when

assistance has been given the ewe in lambing or it may occur when portions of the afterbirth are retained. Retained afterbirth is not common in ewes. If treatment is not begun promptly, the ewe is almost sure to die. The animal has a high temperature, breathes rapidly, strains frequently, and may have a foul-smelling discharge from the vagina.



FIG. 17.—Method of douching an ewe for a discharge from the uterus.

If the ewe is worth saving, she should have the services of a veterinarian. The owner often waits too long before calling for help. The uterus should be examined by hand and remnants of the afterbirth removed. After this has been done, the uterus may be washed out with a mild salt solution in much the same way as described for the treatment of retained afterbirth in the cow (Fig. 17). At best

the chances for the ewe's recovery are none too good, because sheep have very little stamina to resist such infections. No hope can be given unless the treatment is begun before the ewe becomes prostrated.

Garget

Mammitis or garget is an inflammation of the udder, much as in the dairy cow. It is caused by the entrance of germs into the udder. Over-feeding may cause the production of too much milk with subsequent lowering of tissue resistance inside the udder, and thus bring on an attack of garget, but germs must be present inside the udder before the disease can begin.

The udder becomes inflamed, hot, and swollen. It is painful to the touch and the ewe appears nervous and restless when suckled by the lamb. As the disease progresses, the udder becomes doughy and then hard. About this time, the milk becomes blood-stained, thick, yellow, and chunky. If nothing is done in the way of treatment, the udder may turn blue or green. This is the beginning of the end. All or only part of the udder may be affected.

The first step in the treatment of this disease is to give the ewe from 4 to 6 ounces of Epsom salts. Try to keep the bowels moving freely by the use of succulent green feed and roots. Always consider this a contagious disease and separate the affected ewe from the flock. Milk the infected material from the udder frequently and apply hot towels and massage. Secure a pail of hot water, a towel and a jar of vaseline. Soak the towel in the hot water and, after wringing it out, it should be applied to the inflamed udder in the same way a barber uses hot towels on the face before shaving. Do this for several minutes and then grease the udder with the vaseline and knead it with the doubled fist. Liniments are frequently used but the heat and rubbing does the work just as well. If this treatment is begun before the udder becomes very hard, abscessed, or green in color, good

results may be expected. If the treatment is so long delayed that the udder is abscessed or green, it may require lancing or even complete removal. This is seldom done because the chances for recovery are slight.

Pre-lambing paralysis

This is sometimes called bred-ewe disease, and is more frequent on the farm than on the range. The farm flock is more likely to be over-fed with little or no exercise, while the range flock usually has sufficient exercise. As the name would indicate, this disease affects ewes just before they are due to lamb and appears in the form of a paralysis.

The exact cause is unknown, but it is thought to be induced by the use of too much concentrated feeds, together with lack of sufficient exercise to throw off the poisonous waste products of the body.

The symptoms shown by the sick ewe vary somewhat, some being unconscious when found, while others may die in convulsions. If the disease moves more slowly the animal may appear weak, stagger, and lose its appetite. This is followed by dullness and finally complete paralysis with or without muscular spasms. A dark-colored discharge is often observed from the vagina. If the ewe should lamb very early in the attack, she may recover naturally, otherwise the lambs may be born dead, the ewe dying shortly afterward.

Treatment is simple and not especially good, but may be tried if the animal is not too near death; administer a 5- or 6-ounce dose of Epsom salts, followed by a pint or two of strong black coffee.

Prevention is far better than the treatment of pre-lambing paralysis, but unfortunately this is often neglected. The pregnant ewes should be fed as directed in the first part of this chapter and forced to exercise each day. This is very important as lambing time draws near. The exercise gained

by walking to and fro to feed will many times be sufficient. Some sheepmen prefer to scatter the hay over a large area of ground to encourage walking. Exercise and sufficient but not over-feeding will prevent pre-lambing paralysis. This disease is also called acidosis.

CHAPTER XIV

OTHER COMMON SHEEP TROUBLES

THIS chapter includes some common sheep practices and diseases that do not naturally fall into any of the other groups. Their relative importance should not be underrated on this account, because docking, castration and bloat, for example, are leading problems on most farms where sheep are raised.

DOCKING

All lambs should be docked when they are a week or two old. If desired, they may be castrated also to save time and labor. The lamb's tail adds nothing to its beauty and when dirty and matted with manure and other filth it is very unsightly and may act as a breeding place for fly maggots. The older females, with their tails left on, often fail to breed on this account. So far as known, the tail serves no useful purpose and is far better off than on. The general appearance of the animal is much improved and its market value increased.

The tail may be removed with regular docking irons or pincers especially designed for this purpose. They may also be cut off with a sharp knife, tinner's snips or sharp chisel. The best, cleanest, fastest and safest way is the use of the heated docking iron, while the next best is a strong and sharp knife.

Docking with hot pincers

The tool used in this operation may be purchased from any stockmen's supply house. If many lambs are to be docked, it will pay to invest in this labor-saving device.

The docking pincers are always used red hot and for this purpose a fire must be arranged beforehand. The assistant may straddle a saw-horse or other wooden bench, while holding the lamb with its rump toward the person operating the docking iron. The tail should be severed about $1\frac{1}{2}$



FIG. 18.—The hot pincer method of docking. Note how the tail is passed through hole in board to prevent injury to lamb.

inches from the body of the lamb (Fig. 18). An easy way to measure this and at the same time protect the lamb from the heat of the iron is to bore a hole through a piece of $1\frac{1}{2}$ -inch board large enough for the tail to be passed through. This board may be nailed to one end of the saw-horse.

The assistant straddles the saw-horse, holding the lamb securely the while and pokes its tail through the hole in the board. The lamb is held firmly against the board with the tail sticking through on the other side (see Fig. 18). If the rump of the lamb is pressed tightly against the board, the stump will be about $1\frac{1}{2}$ inches long because the operator clips the tail off close to the other side of the board.

The hot-pincer method is popular because the stump is seared over and there is little, if any, hemorrhage or bleeding. The sharp knife will cut off the tail faster, but there is always more or less blood lost. The hot pincers sterilize the end of the stump and this needs no further attention, except in fly time, when it should be smeared with pine-tar or other fly repellent. Maggot-infested tail stumps are a nuisance and needless if proper precautions are taken to avoid them.

With plenty of help to catch and hold the lambs, the man using the pincers may dock several with one heating of the iron. The lambs must be corraled and ready and the operator must work fast. The iron should be heated to a rich cherry-red color, hotter than this being a disadvantage. A heated chisel is sometimes used instead of the regular pincers.

Docking with a knife

When only a few lambs are to be docked, the owner may not wish to buy a special docking tool and may prefer to use a stout sharp knife (Fig. 19). The assistant secures and holds the lamb with all four feet together. He may stand or sit, according to his or the operator's preference, with the lamb's back in his lap and the rump toward the man with the knife. The operator grasps the tail with his left hand and feels for a joint about $1\frac{1}{2}$ inches from the body (see Fig. 19). When this is located the skin of the tail is pressed backward toward the body of the lamb and the tail cut off through the joint selected. After the tail is severed, the skin which was pushed back now comes into

place and covers the bony end of the stump. One should never try to cut through the tail bones, but always into the joint, making the cut from the under or short-haired side of the tail. A steady and firm pressure on the knife will remove the tail very quickly and almost painlessly.

If the tail bleeds considerably it may be tied with a piece



FIG. 19.—Docking with a sharp knife. Note how the lamb is held by the assistant.

of string. This should not be left on more than an hour or two, otherwise the tied end of the tail will slough off. In fly time, the stump should be daubed with pine-tar or sheep dip to prevent maggots.

Precautions for docking

Docking should be done when the lambs are young. A warm day should be selected before flies become numerous.

Neither docking or castration should be done on rainy days. Close watch should be kept of the docked lambs for a few days until the wounds are healed. They are better off on a clean dry pasture, but if the weather is not satisfactory they should be placed in clean, dry and well-bedded quarters.

CASTRATION

All ram lambs not intended for breeding purposes should be castrated or "altered." Their market value is increased, they are gentler, gain faster, and yield a much better carcass. All stock buyers discount uncastrated lambs two or three dollars a hundred-weight. The operation is simple and one who will pay attention to cleanliness and follow directions should be able to castrate lambs successfully.

Ram lambs should be castrated when they are a week or ten days old. All the male lambs should be placed by themselves a day or two before the operation. This will avoid undue excitement and make catching them much easier. Lambs must never be castrated on dark, cold, or rainy days. This may seem an unnecessary precaution, but disastrous results often follow carelessness in this respect, for many lambs will die for no apparent reason. Select a bright sunny day before the fly season opens. Avoid performing the operation in the barnyard. Choose a clean dry place, keep the hands and instruments clean, and no fear need be felt as to the outcome.

How the operation is performed

Some farmers may pride themselves on their ability to bite out the testicles, but this practice is a relic of bygone days and should not be done except as a trick performance. The only instrument needed for this operation is a sharp knife which has been sterilized by boiling; provide a pail of disinfectant solution and a small dish with some of the same disinfectant in it. When the knife is not in use it should be kept in the dish of disinfectant. If the operator's hands

become dirty, they may be washed in the pail of disinfectant. A clean towel will aid in keeping the hands and knife dry.

When everything is in readiness, the assistant catches and secures the lamb with all four feet held together. He



FIG. 20.—Position of the operator, his assistant and the lamb as the end of the bag is being cut off.

may stand or sit with the back of the lamb pressed close in his lap or held between the knees. This will bring the rump toward the operator and leave the scrotum or bag within easy reach.

The bag is grasped firmly at its tip with the thumb and forefinger of the left hand and pulled out tightly (Fig. 20).

Do not hesitate or falter. Cut off the lower third of the bag with one clean sweep of the knife. This will leave the bag open below for proper drainage later. The so-called uncovered operation will now be performed. Seize the bag firmly with the left hand, squeeze out the testicles, and



FIG. 21.—Showing how the testicle is pulled from the bag.

hold them firmly in position. The exposed testicles are then pulled out with the fingers of the right hand. A knife is not used to sever them. A strong firm pull is exerted and the testicles snap off very easily (Fig. 21). After the testicles are removed, the wound should be doused with a small quantity of the disinfectant solution.

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When young lambs are castrated, the testicles break off with the slightest pull and seldom require cutting, while older animals must have the cord scraped with the back of the knife-blade. This leaves a roughened cut surface which does not bleed as much as if cut with the sharp edge of the blade. The blood-vessels supplying the testicles in the young lamb are small and stop bleeding readily. In the older animal the vessels are frequently large and there is more danger of continued bleeding if this precaution is not taken.

Care of the lambs after castration

The castrated lambs should be placed in clean quarters or turned into pasture if the day is bright and warm. Too much emphasis cannot be placed on the necessity of avoiding damp or cold weather for this operation. The animals should be watched closely for a few days and, if the flies are numerous, the end of the bag should be dipped in pine-tar. A maggot-infested bag must be cleaned and the worms removed with forceps. Chloroform poured into the wound will kill the maggots, after which they must be picked out by hand.

BLOAT

Bloating in sheep is essentially the same condition as that of cattle. Sheep have the same kind of digestive apparatus as cows, namely, four stomachs, the first or paunch acting as a storage reservoir for food. It is here that bloating takes place. Sheep bloat because of the retention of large quantities of gas in the paunch or rumen. There is always a certain amount of gas forming in the rumen, but if this organ becomes overloaded with fermenting material the gas cannot be passed off as rapidly as it forms and bloating follows.

Cause

Bloat is caused by the too-rapid consumption of easily fermented feeds. Any kind of damp or wet forage may

result in the bloating of a few sheep. When sensible precautions are overlooked, sheep bloat on alfalfa and sweet clover, but this should not be held against these excellent crops. Sheep may bloat when fed quantities of turnips, rutabagas, or cabbages. Sugar-beet pulp, also, must be used cautiously at first.

When sheep are first turned on to a luxuriant pasture of alfalfa or sweet clover, they are likely to eat greedily and overload their stomachs. The danger of bloating at this time is greatly increased if the pasture is wet with dew or rain, or when the animals drink a large quantity of water after filling up with the juicy green plants. In reality, bloat is caused by the misuse rather than the use of green pasture. If hungry animals gorge themselves during the first few days on such pasture, some are almost sure to bloat. This is the owner's fault rather than the crop or the animals.

Symptoms

Sometimes bloated animals are found dead in the pasture. If the flock is watched, some of the sheep may be observed to stop eating, look very helpless and anxious, and show signs of pain. The affected animals breathe rapidly and the swelling increases until the distended paunch is plainly seen on a level with or even above the hip bone. The animal does not like to move and, when forced, walks stiffly, staggers and falls down, frequently dying in convulsions. The actual cause of death is suffocation, caused by the pressure of the greatly enlarged paunch against the diaphragm. This makes breathing very difficult or impossible. The left flank is ballooned until it sometimes rises higher than the back bone of the animal.

When several sheep are affected at the same time, the losses are often heavy because bloating progresses so rapidly that the owner is hard pressed to work fast enough to treat each animal in time to save its life. Sheep appear to bloat easier and die more quickly than cattle.

Treatment

There is no sure bloat cure. When sheep are bloating, fast work is imperative. If the first animal is not badly bloated and is in no immediate danger, simple methods of relief may be tried before using the knife or trocar and cannula. This latter instrument is specially designed to relieve bloat in cattle or sheep and should be part of the regular first-aid equipment.

Mild or beginning cases of bloat may be reduced by forcing the animal to chew on a piece of rope smeared with pine-tar. This may be passed through the mouth and tied back of the head. The tarred rope will cause the animal to chew and swallow, thus encouraging belching of the gas. The belly or side of the abdomen may be massaged with the fist. This may help to relieve the animal if the bloating is not severe and the owner has sufficient patience.

When such simple methods fail and the bloating and discomfort increase, the rumen or paunch must be tapped to release the gas. Do not wait until the animal is exhausted before doing this. If the regular trocar is not at hand, a clean and sharp-edged knife will do. Stab this into the distended paunch about half-way between the point of the hip bone and the last rib. If neither can be felt, make the cut at the place where the swelling is greatest. After the knife is inserted and the gas starts to escape, the opening should be made somewhat larger to permit free passage of all the gas. After the gas has disappeared, the cut may be sewed together with clean string threaded in a coarse darning needle.

Now that the animal is out of danger, $\frac{1}{2}$ ounce of aromatic spirits of ammonia mixed with 4 or 5 ounces of water or $\frac{1}{2}$ ounce of turpentine in 6 ounces of warm milk or raw linseed-oil may be administered. Either of these doses will prevent further fermentation in the paunch. In addition, the animal should be given 6 ounces of Epsom salts to remove the fermenting mass in the stomach.

Prevention

On some farms alfalfa and sweet clover have been unjustly condemned because a few animals died from bloat. If the flock is handled properly, most of this may be avoided.

Animals accustomed to scant pastures should be broken in gradually to the new forage and never permitted to gorge themselves. They should be turned in for short periods each day until they get over the novelty. If unused to such green legume pastures, the flock should be kept off after a heavy dew or rain. Ten or eleven o'clock in the morning will be time enough for the fields to dry. Wet forage ferments much more easily and when sheep eat too much, trouble usually follows.

The flock should not be turned on sweet clover or alfalfa for the first time when they are ravenously hungry; give them a partial fill of dry hay before they are allowed to eat the luscious green plants.

Some shepherds keep a stack of last year's hay in the pasture for the animals to eat when they tire of the green leaves and seek variety. Trouble seldom occurs if these common pasture crops are used with discretion and with the knowledge that they will cause bloating if ordinary precautions are not taken.

Many preparations to prevent bloat are on the market. Among these are anti-bloat salt and mineral mixtures combined with certain drugs or chemicals. All are ineffective. Proper flock management is far better than cures or preventives.

GRAVEL OR STONES IN THE BLADDER

Gravel or stones in the bladder of sheep occurs commonly. The cause of this condition is not definitely known, but it is thought that the consumption of large quantities of sugar-beets, mangels, and other roots which contain considerable amounts of lime salts may have a bearing on the disease. This belief is entirely circumstantial and is arrived at by

the fact that urinary stones are found frequently in flocks fed on these roots.

The urinary stones bother rams and wethers chiefly. The passage or canal through which the urine travels from the bladder is very small and a tiny stone is often sufficient to hold back the urine. The peculiar shape of the end of the penis also tends to encourage the trouble. It is shaped like the letter S and it is at this place that the stoppage most often occurs.

Symptoms

The animal is restless, tries to urinate, but succeeds in passing little more than a dribble. The animal stops eating and may walk stiffly with its back arched, showing evidence of pain. Since the urine is retained in the bladder for long periods, it may be ill-smelling and very much discolored. The arched back, together with frequent and fruitless attempts to urinate, indicate that the free passage of urine is blocked, and if nothing is done to relieve the animal it will soon die.

Treatment

If the stone which dams back the urine is lodged in the S-shaped portion of the penis, this may be clipped off with a pair of scissors. Should this operation provide no relief, it is evident that the stone is farther back toward the bladder and must be removed by a much more serious operation, which the owner should never try himself.

It has been suggested that certain drugs or chemicals be given in the feed or water in an attempt to dissolve the stones in the bladder or the urinary canal, but this is never successful. If the ram is not especially valuable, it should be slaughtered when the clipping off of the S-shaped end of the penis fails to provide relief.

GOITER

When goiter occurs in sheep it is commonly called big-

neck, woolless or hairless lambs. In some seasons the losses from this disease are heavy, as many as a dozen or more lambs in a small flock being affected. In some large flocks the percentage of goitered lambs may run as high as 50 per cent of the crop. A more complete discussion of the goiter problem and the circumstances under which it occurs is found in Chapter VI. Goiter is very common in the northwest states. It is not a contagious disease.

Cause

Goiter in lambs is caused by a shortage of iodine in the feed supplied to the ewes when they are with lamb. This lack of iodine is in turn felt by the lamb developing inside the mother, and the thyroid gland increases in size as a result. The crops in some sections are evidently naturally deficient in iodine, which accounts for the great prevalence of goiter in all classes of animals in these regions. Without its normal amount of iodine, the growth of the lamb in the womb of its mother is retarded.

Symptoms

The affected lambs are born with the enlarged thyroid gland. If the gland is very large, the lamb is usually dead at birth or lives only a few hours. The swelling in the neck just below the lower jaw is very plainly seen and no one should have the least difficulty in recognizing this disease. The hair or wool coat of the lambs may be very thin or entirely absent.

Lambs with very small goiters may live, but those with large swellings in the throat are usually born dead. Small goiters may be treated with fair success. The skin over the swelling is clipped or shaved and tincture of iodine is painted on frequently, that is, every other day. Some lambs recover with such treatment and the swelling disappears as they grow older. It is far better to take proper steps to prevent goiter than to attempt treatment of the affected lambs that are born alive.

Prevention

When iodine is fed to the ewes during at least half of the period of pregnancy, goiter seldom, if ever, occurs. The iodine may be given in several ways. Two-grain tablets may be purchased at the drug-store and one tablet should be fed to each ewe daily while she is pregnant. Some farmers dissolve $\frac{1}{2}$ ounce of potassium iodide in the drinking water daily. This amount is sufficient to treat the water for 100 ewes.

The iodized salt method is the best, simplest, and cheapest way to feed iodine; mix 1 ounce of potassium iodide with 300 pounds of common stock salt and feed during the entire period of pregnancy. Common medicated salt is worthless for this purpose unless it contains sufficient iodine. The method of mixing the iodine and salt is described on page 143.

POISONING FROM SWEET-CLOVER HAY

For a more general discussion of the disease caused by poisonous sweet-clover hay, the reader is referred to Chapter VI.

There has been some question as to the danger of feeding poisonous sweet-clover hay to sheep. Schalk and Roderick, of North Dakota, report the feeding of hay that had caused the death of cattle and sheep. Only one of the sheep in the test group was affected and this occurred after the hay had been fed for several months. Other investigators point out the possibility of danger from feeding such hay to sheep, but all are agreed that sheep are not nearly as susceptible to poisoning as cattle.

It should be remembered that the term "spoiled" sweet-clover hay is often used when referring to moldy hay and the reader is again warned that the presence of molds on sweet clover does not necessarily make the hay harmful, and some samples of highly poisonous hay are entirely free from molds and look all right as far as curing is concerned.

If cattle have died after eating poisonous hay, sheep may

be fed the hay cautiously, but at the first sign of sickness other hay should be substituted. It might be well to alternate weekly the feeding of the bad hay with some other clean and safe hay. Just what takes place in the hay to make it poisonous no one knows, but it appears not to be due to any of the common molds found in most stacks of sweet-clover hay.

Even though sheep are not especially susceptible to this kind of poisoning, it would be an added measure of safety to take them off sweet-clover hay about two weeks before any surgical operation is to be performed. The actual cause of death in sheep when it occurs from eating poisonous sweet clover is internal bleeding, the same as in cattle. The blood does not coagulate as fast as normally and, if sheep are in the early stages of this disease when operated on, they may bleed to death. This is merely a precaution which will not inconvenience most farmers.

To avoid any confusion in the mind of the reader it is explained that the excessive bleeding which may occur after castration or docking refers only to those animals that have been on sweet-clover pasture for some weeks directly preceding the time the operation is performed. It does not refer to placing animals, recently operated on, in sweet-clover pasture for the first time. This latter practice would be harmless because it would require some days on the pasture before the animal developed the tendency to bleed easily.

There is considerable difference of opinion as to the danger of excessive bleeding in sheep operated on after they have grazed on sweet-clover pasture. There are arguments pro and con. One investigator fed green sweet clover to a group of animals for weeks and performed operations on them without a single case of abnormal bleeding.

Moldy hay or silage

Molds on hay or silage have a very bad reputation, but are not harmful to sheep. When for any reason sheep

become sick or die while being fed such hay or silage, it is very convenient to blame the feed without sufficient proof that it was the actual cause. Most sweet-clover hay and silage contain molds of various kinds, but this is not necessarily bad for the sheep. The molds may produce certain changes in the hay or silage as to make it indigestible, but molds have never been convicted beyond a doubt of being the direct cause of deaths in sheep.

As pointed out in the discussion of forage poisoning in horses, molds may favor the growth of botulinus germs and thus cause poisoning, but aside from this molds are not harmful. Some investigators may even question the rôle that molds are supposed to play in the production of botulinus or forage poisoning. Fitch, Eckles, and Seal, of Minnesota, fed pails of pure molds to sheep without any ill effects. From their experiments and feeding trials, it would appear that the poisonous properties of molds are much over-rated.

SORE EYES

Sheep and especially lambs suffer from a disease commonly called sore eyes. This eye trouble may be caused by some irritation such as injuries, dust, or pollens from grasses. In some sections this disease may become general in several of the neighborhood flocks and appear to be contagious.

Symptoms

The disease begins as an inflammation of the eyeball, the eye being inflamed, reddened, and often showing a discharge which, while watery at first, usually becomes yellow and sticky after a few days.

The affected animal keeps its eyes closed and tears flow freely. The eyelids soon become affected and may be swollen shut with a gummy secretion along the edges of the lids. If nothing is done to allay the irritation, the eyeball may become cloudy and ulcers may be seen. These usually break and give the whole eye a nasty appearance. Repeated attacks of this disease often end in the sheep becoming

blind, resembling moon blindness of horses in this respect.

Treatment

The affected animals should be removed from the flock and placed in a dark or dimly lighted shed or barn, the eyes washed with a mild boric acid solution made by dissolving a tablespoonful of boric acid in 2 quarts of warm water. This will relieve the irritation and reduce the inflammation. It will be necessary to have some one hold the animals during treatment because the eyes are very painful and the sheep will resist handling. The assistant should back the animal into a corner, straddle it, and hold the head in position for treatment. When the eyes are thoroughly cleansed, place two or three drops of a 10-per-cent solution of argyrol directly on the eyeball. This solution and an eye-dropper may be purchased at any drug-store. Repeat the treatment at least once daily and keep the animals confined in a dark place until they fully recover.

TURNED-IN EYELIDS

The veterinarian terms this disease entropion while the farmer may call it sore eyes. Lambs and even older animals, especially of the Merino breeds, are most often affected. The eyelids become turned in and the eyelashes irritate the eyeball, causing an intense inflammation which may eventually lead to blindness. When lambs are affected, the eyes are kept tightly closed and the animal, being unable to find its mother, often starves to death.

A surgical operation is necessary to correct this condition. Some farmers may try to do this themselves, but the best advice is to leave this for the experienced veterinarian.

One operation is to pull the eyelid out, pinch it together and cut a buttonhole in it with a pair of sharp scissors. The hole may be 1 inch long and $\frac{1}{4}$ inch wide; cut close to the edge of the lid but not too deep or through the lid. When healing takes place, the tissues draw together, causing the

eyelid to resume its normal position. To prevent a reoccurrence of this trouble, the wool should be kept clipped away from the face, especially near the eyes. When properly performed, the operation is usually a success.

SNUFFLES

Snuffles is another name for a common cold or catarrh and is about as tedious and difficult to treat as a severe head cold in man. Snuffles is often caused by reduced vitality after exposure to dampness, rain, or an unexpected period of cold weather. Sometimes sheep become chilled after shearing operations, dipping too late in the fall, or docking and castrating in bad weather. When sheep mill in a dusty corral, the resulting irritation of the passages of the nose may bring on this disease.

Symptoms

There is a watery discharge from the nose which later becomes yellow, thick, or stringy. Some farmers may consider this disease of little importance, but this is a mistaken idea because many animals, especially lambs, die from colds of this kind.

The animal feels miserable and looks wretched. The dried pus sticks about the nose and mouth and mats the wool, causing the animal to present a very unsightly appearance. The eyes are inflamed and watery and the sheep may show some difficulty in breathing. The appetite is gone and the sick sheep stands around in woe-begone attitudes. In severe cases, pneumonia may develop followed by exhaustion and death.

Treatment

A clean shelter should be provided for the sick sheep. It should be free from draughts and well bedded with clean dry straw. Bathe the eyes and wash out the nose with a mild boric acid solution made in the same way as described

for the treatment of sore eyes. The very weak animals may be given a dose of strong black coffee as a stimulant. Keep the nostrils swabbed out so the animals are able to breathe freely. Good care, clean forage free from dust, plenty of water, and attentive nursing will usually effect a cure.

The shepherd will need great patience to treat the eyes and nose daily with the boric acid solution. If a nose syringe or spray is available, a solution containing camphor or oil of eucalyptus may be sprayed directly into the nostrils. The inhalations of various fumes as commonly recommended for the treatment of such conditions in man are not satisfactory.

TRIFOLIOSIS (BURNING OR BLISTERING OF THE SKIN)

The name applied to this disease of sheep, cattle, swine, and horses will require some explanation. Trifoliosis is a skin disease and affects light-skinned and some dark-haired animals with white spots on the body, such as a horse with a white face or white about the feet and ankles. It occurs when such animals graze on wet alsike clover, rape or St. Johnswort. The disease is sometimes called dew poisoning. St. Johnswort is a common eastern plant in worn-out pastures, in woods and along hedge-rows. It bears a yellow flower and may stand a foot or two tall. These plants are often eaten mixed with other forage. None of these plants is harmful when dry. The udder and other white parts of cows blister and swell from such exposure to St. Johnswort, although pastures containing a large amount of it may injure any animal. Hogs burn and blister badly on wet rape. Inasmuch as rape is a common hog pasture, swine are most often affected.

The poisonous effects of any of these plants depend on exposure to the sun's rays while the animals are grazing in such fields after a rain. Wet plants and sunshine are necessary before the disease can begin. Many refer to this disease as sunburn.

Symptoms

The skin becomes reddened, swollen, and blistered. The blisters break and often leave raw ugly sores. Horses will bite and scratch the affected white patches about the feet and muzzle. If the lips and tongue are exposed, these parts may swell and drooling may be observed. White-skinned hogs burn, blister, and peel badly on either alsike or rape. Sheep may burn and swell about the eyes, nose, and mouth, the remainder of the body being protected by the coat of wool. The ears may be so badly swollen as to hang down and the eyes are frequently swollen shut. Even light-skinned dogs such as collies may be burned while tending sheep on wet pastures. If the weather alternates between thunder showers and bright sunshine and the flock is kept on the pasture, the disease may become very extensive until, in some instances, the animals are very scabby and the ears and tails may fall off.

Treatment

As soon as the disease is discovered, the animals should be placed on other pastures where they quickly recover. When this is done, no other treatment is usually necessary. If the sores and blisters are extensive and slow to heal, zinc oxide ointment or carbolized vaseline may be used to hasten the healing.

Alsike clover and rape should not be condemned because of this disease. If the owner is careful to keep the animals off such fields while they are wet, no trouble will be experienced. While light-skinned animals suffer most, red pigs, for example, frequently are victims. Probably all animals regardless of color are affected, but the dark-skinned ones are not burned enough to cause notice or apparent discomfort.

BIG-HEAD

Big-head is a peculiar disease and is observed only in the western range states. It affects sheep in the spring and

early summer. As a rule, it begins suddenly and often ends in the death of the badly affected animal.

Cause

The cause of big-head is unknown, although weather conditions are accused of being responsible. It is commonly observed on hot days after a cold or stormy night. On such days the range flock may be driven rapidly to new feeding grounds. Due to the fact that the disease appears to be confined to such states as Utah, Idaho, Wyoming, Nevada, and Montana, some observers surmise that big-head may be caused by some poisonous weed yet unidentified. European writers have described a disease which they call fagopyrism, caused by exposure to sunlight after animals have been feeding on buckwheat. The symptoms closely resemble those of big-head and have led many to believe that some cause of a similar nature is responsible for big-head in this country.

Symptoms

The face swells very rapidly, the swelling often involving the ears and throat. The animal is very restless and may shake its head and try to rub it against any convenient object. Itching is a very prominent symptom. At times the swelling is so great that the eyes are kept tightly closed and the animal, being blind, may wander away from the flock. When examined, the skin of the head and neck is very red and there is a discharge from the nose. In very severe cases the head swells far beyond its natural size and the tongue is swollen until it completely fills the mouth. This, together with blindness, makes eating impossible and the sheep finally wanders away and dies of starvation or exhaustion.

Treatment

Practically all of the badly affected animals die. A few mild cases may recover if given rest and good nursing. Unfortunately this is not always practicable under range

conditions and most of the affected sheep are destroyed. Greasing the head with vaseline or olive oil is helpful to relieve the irritation caused by the swellings. Without knowledge of the exact cause of this disease, preventive methods cannot be outlined.

PLANTS POISONOUS TO SHEEP

Plant poisoning in sheep is relatively uncommon on the farms of the East and Middle West. This is due in part to the scarcity of poisonous plants and also to the fact that most farm flocks are comparatively well fed and cared for. They usually have access to additional feed when pastures are short and are not often forced to undergo periods of partial starvation. It is well known that sheep as well as other live-stock do not crave poisonous plants, but eat them only when driven by hunger and the lack of other suitable forage. Such conditions frequently occur in the range states of the West and often cause severe losses.

A number of plants known to be poisonous to cattle were discussed in Chapter VI. Some of these may cause the death of sheep when conditions are favorable. Among the plants poisonous to both cattle and sheep are water-hemlock, young cockle-bur, white snakeroot, and prussic acid poisoning from eating wilted sorghum or wild cherry leaves.

On western ranges the chief poisonous plants of sheep are death camas and the lupines. Other animals may be affected, but sheep suffer by far the greatest losses.

Death camas

While cattle and horses are sometimes poisoned by this plant, sheep appear to be the most susceptible, as many as 1,000 being reported killed in one large range flock. Death camas is often called poison sage, swamp camas, and poison onion. It is usually found in low wet places.

Death camas is one of the deadliest of all range plants. It is a perennial belonging to the lily family, grows singly, forms a bulb-like root, and has five to seven long, slender,

green, grass-like leaves. The root bulb is buried deeply in the ground. The plant grows from 4 to 18 inches tall, has yellow flowers on a long slender central stalk, and may be found in masses covering acres.

Death camas may be distinguished from wild onion by the absence of onion flavor. It is widely distributed throughout the Northwest and Pacific range states. All parts of the plant are poisonous, but the roots are rarely pulled up by grazing animals. One to two pounds of death camas is sufficient to poison a sheep.

Some poisoned sheep froth at the mouth, vomit, breathe rapidly, and die in convulsions if large amounts of the plant are eaten. Others may become very weak, lie down, and go without food for a long time before they die of exhaustion. Animals that have eaten only a small quantity may show some of the symptoms mentioned and recover. As a rule, most of the affected sheep die, because it takes only a very small quantity of death camas to cause fatal poisoning. Death camas is dangerous throughout the summer months, but most of the losses occur in the spring and early summer.

There is no treatment for poisoning from death camas. Pastures or range where the plant grows abundantly should be avoided, at least until after the flowering stage. After that time the danger is not considered so great.

Lupines

The lupines are widely distributed over the western range section of the United States. They are perennials and grow in clumps 1 to 3 feet tall. The flowers are blue or purple and develop seed-pods, the seeds being especially poisonous. The seed-pods are silvery in color and have a hairy surface. Sheep are the chief sufferers from lupine poisoning, the losses occurring more often in the late summer and fall months. Sheep may forage on lupines before the plant has gone to seed without any harmful effects, but when a hungry flock comes upon a patch of lupine when the seeds are in the pods,

fatal poisoning often follows. Some species of lupine are not poisonous, but it takes an expert observer to pick them out and, for this reason, it is always best to avoid all varieties, good or bad.

Sheep may show signs of poisoning within two or three hours after eating lupines. The first symptom noticed is extreme nervousness, followed by the tendency to move aimlessly in any direction. At times the affected animals butt trees, posts, or fences. When large numbers of sheep are poisoned, they may leave the flock and travel blindly in all directions. The sick sheep become very weak and may froth at the mouth. Frothing, loss of sense of direction, and the butting tendencies are considered typical of this disease.

Since there is no treatment or cure for this disease, the herdsman must prevent the sheep from eating the plants when they are in the seed-pod stage. A flock of sheep should not be driven through patches of lupine when they are very hungry. Under ordinary circumstances sheep will not touch lupines when other forage is plentiful. If it is necessary to move a flock over ground where lupines are numerous, they should be given a fill of safe forage before they start and then driven slowly through. If a hungry flock is hurried through such a place, they will perversely grab enough to kill them as they pass along. Sheep will seldom pick out lupines if better feed is available and they are not half-starved.

PART IV

DISEASES OF SWINE

CHAPTER XV

INFECTIOUS DISEASES OF SWINE

THE list of infectious diseases of hogs is not long, but the losses from them are often exceedingly heavy. Most of the diseases causing the greatest losses are considered very difficult to treat or cure, but lend themselves readily to simple means of prevention. It is almost impossible to estimate the number of swine lost each year, but it no doubt runs into the millions. The principal infectious diseases responsible for this tremendous handicap to successful swine husbandry are hog cholera, necrotic or infectious enteritis (intestines), necrotic rhinitis (nose), necrotic stomatitis (mouth), and necrotic dermatitis (skin). The last four diseases constitute a group which most farmers refer to as "necro."

Thousands of hogs are infected with tuberculosis, but since very few die on the farm, most farmers are not greatly concerned by this disease. It affects their pocket-books indirectly by way of reduced returns from the packer, because he in turn must cover his losses by an overhead charge which is eventually absorbed by the grower of the diseased hogs. This disease has been gaining headway for a number of years and recent investigations show that much of swine tuberculosis is derived from the farm flock of

chickens. Probably steps will be taken in many states to reduce the percentage of this infection in swine.

The situation is entirely different with hog cholera and so-called necro infections. Pigs affected with these diseases die on the farm where the farmer can see and feel the effects of the loss. It is not unusual to hear of as many as 200 or 300 hogs dying from cholera on one farm. This, of course, is a distinct shock to the owner and also a direct loss which is felt both in the market value of the hogs and the worth of the feed consumed by them up to the time they died. Infectious enteritis and the other forms of necro move much more slowly. These diseases drag over a longer period of time during which many animals lose weight, become stunted, and eventually die.

Influenza, or flu as it is often called, frightens many farmers, but if handled sensibly the losses are seldom severe. Abortion disease and pneumonia take a small annual toll on scattered farms in any given section. The discussion following is direct and the suggestions are thought to be practical, reasonable, and effective. On some points there may be differences of opinion, but these should not hinder acceptance of the main truths.

HOG CHOLERA

Cholera is the most deadly infectious disease of swine. For many years it has been the chief obstacle to profitable swine-growing. It has been widely advertised through educational campaigns, books, bulletins, and lectures, but many do not profit by the experience of others. There is now in existence a simple and relatively safe means of hog cholera prevention, but there is no recognized cure. In spite of this, after the scare of an epidemic is over, the losses are quickly forgotten and herds go unprotected until the disease breaks out again. Hog cholera vaccination is a safe way to prevent losses from this disease. It should be practiced regularly in sections where the disease is firmly established. It is not advocated as a cure. It is merely a form of life

insurance against a very common and destructive disease. Whenever vaccination is condemned, it is usually through lack of knowledge concerning its limitations.

Hog cholera is widely distributed in all parts of the world, the heaviest losses being observed in those countries where hogs are raised in greatest numbers. The first reliable report of the disease in the United States was made in Ohio in 1833. It may have occurred before that time, but this date is usually accepted as the first official recognition of its existence in this country. Since that time the disease has spread to every state in the United States and causes an annual loss of at least \$25,000,000.

Cause of hog cholera

It has been proved definitely that hog cholera is a contagious disease, even though one frequently hears statements to the contrary. Some farmers think cholera is caused by feeding pigs too much soft corn. While faulty feeding methods and filthy surroundings are always undesirable, such practices in themselves cannot cause cholera. This disease can only be produced by a specific germ. Weak and unthrifty pigs fall easier prey to the disease, but the weakness and unthriftiness is not the cause of cholera. It merely hastens death after the animals become infected.

The swine-grower who believes that cholera is caused by improper feeding, worms, necro, or a shortage of minerals in the diet is misinformed and sooner or later may suffer heavy losses. Even with much truthful publicity there are still many who refuse to accept the fact that a specific germ is responsible for hog cholera. This belief is further increased by the preposterous claims made by the venders of certain tonics, minerals and other so-called body-builders. The owner of swine who ignores the advice of his state agricultural college, experiment station or veterinarian, and looks to the itinerant peddler for his veterinary information is sadly handicapped.

It is freely admitted that the germ of hog cholera has never been seen, even with a microscope. This, however, proves nothing, because the germ is probably so small that no microscope is powerful enough to make it visible. This is true of other diseases besides hog cholera. A microscopic examination of the blood from a hog dying of cholera will fail to reveal the germ, but if this same blood is injected into the body of another healthy susceptible pig, hog cholera always follows. The germ is there even though it cannot be seen with present methods of examination.

The germ of hog cholera is often spoken of as a virus. This germ or virus is found in the blood, urine, feces, and the discharges from the eye and nose of a hog sick of cholera. All breeds of hogs may be affected, the death rate in most outbreaks being very high. Mule-foot hogs formerly possessed an undeserved reputation for immunity to cholera, but they die as readily as any other kind. No one of the present popular breeds of hogs is more resistant to cholera than another, and any such claims should always be disregarded. There have been attempts to breed a type of swine that would be immune to cholera, but all such efforts have been fruitless.

The period of incubation refers to the length of time between the entrance of the cholera germ into the hog's body and the first signs of sickness. Under ordinary circumstances this varies considerably, but if blood containing the germs of cholera is injected directly into a healthy susceptible hog, it will become visibly sick in three to seven days. An average might be anywhere between these two extremes. This time refers to experimental infection only when the exact moment of infection can be controlled. On the farm, one is not usually aware of cholera until the pigs become sick, but even then the owner may be able to look back and recall some occasion when his pigs were exposed to infection, perhaps after a visit to a neighboring sick herd, where he may have been asked to render assistance.

How cholera spreads

It is always difficult to satisfy the owner as to just how his herd became infected. It sometimes happens that a herd ranging in a field adjoining one where hogs are dying of cholera does not become infected, while animals on a farm several miles away become sick. Such cases cannot be explained, but the owner of unvaccinated hogs which have been exposed to cholera should promptly vaccinate his animals, because his luck may not be so good. Until the germ is identified, it is improbable that all the ways by which cholera may be carried will be known. It is well established that cholera germs may be carried by men, dogs, birds of all kinds, vermin and flies. In the summer months farms are visited almost daily by salesmen, stock buyers, and others who examine the herd and, when the purpose of their visit is accomplished, they go to another farm. When such persons come in contact with pigs sick with cholera, it is easy to see how the disease may be transmitted to other herds.

Most stockyards should be considered infected with cholera and care taken to protect a healthy unvaccinated herd when the owner returns. Creeks passing through infected properties may carry the germs to other farms, especially since some farmers have been known to deposit the carcasses of dead hogs in such places. The carcasses of all dead hogs should be buried or burned. Any farmer guilty of permitting hogs to remain unburied should be reported to the chairman of the local town board.

The ways by which cholera may be carried are innumerable. The manner in which the germs arrive on the farm is usually unknown. Sanitation alone will not keep cholera off the farm in sections where the disease is well established, and no one should deliberately expose an unvaccinated herd to infection. Much satisfaction follows the knowledge that a herd is safe from loss and this peace of mind can only be secured when the herd is protected by vaccination.

Symptoms of cholera

No one can identify cholera by the odor or squeal of the sick pigs, in spite of the widespread belief to this effect. Cholera is not always easy to recognize and even experts fail at times to establish a positive diagnosis. Whenever hogs become sick, any farmer is well advised to suspect cholera first. When a careful investigation shows the disease to be other than this, steps may be taken to fix the blame elsewhere.

If all pigs sick of cholera acted alike, it would be easy to run through the various symptoms and thus identify the disease. Unfortunately this is not the case and a positive diagnosis can be made only by a combination of the history of exposure to cholera, symptoms, and a post-mortem examination of the dead hogs. Hog cholera may be either acute or chronic. In the acute type of the disease, the pigs sicken and die in a few days. In the chronic form the animals may be sick for several weeks before they die.

As a rule, when a herd becomes infected, all the animals do not become visibly sick at the same time. One or two may be observed to refuse feed, preferring to lie in some secluded place. When they are disturbed, they may grunt or squeal and exhibit a marked reluctance to move. As the disease progresses, the sick animals become weaker and frequently stagger when they are forced from their resting place. The eyes may be bloodshot and in some cases there is a sticky discharge about the eyes which often causes the lids to be glued together. Constipation followed by a diarrhea is generally observed in the early stages of the disease. Coughing is a fairly constant symptom if the lungs become affected. When the animals are well advanced in the disease, the skin of the belly and insides of the thighs often assume a dark red or purple color.

The symptoms mentioned may be present in other diseases and these alone will not enable one to recognize hog cholera. As a further aid to a correct diagnosis, the

temperatures of the sick pigs should be taken. One must not excite the herd when taking temperatures, because it is possible to raise a pig's temperature a degree or two by violent exercise on a warm day. The temperature of a healthy hog ranges from 101° to 104° F. A pig sick of cholera may show a temperature of 104° to 108° F. A word of advice on taking temperatures may not be amiss. All stockmen should possess a stout veterinary thermometer. This is built stronger than the human type, but is otherwise the same in performance. Most of them have an eyelet on one end. Fasten a piece of string about 18 inches long to the eyelet and at the other end of the string fix an overcoat button. The string and button will serve to keep the thermometer always accessible and easy to remove from the animal. All thermometers register upward, but do not return to normal unless they are shaken briskly after each temperature reading. If this is not done, accurate readings are impossible, for if the first pig happened to have a temperature of 108°, all the other pigs would show the same or higher reading. The thermometer is greased and inserted into the rectum as far as it will go—the string with button attached remaining outside for easy removal. Allow the thermometer to remain in the rectum about two minutes. If removed too soon it will not register accurately. After the thermometer is removed it should be wiped off with a rag or handful of straw and read. The reading of a thermometer will require a little practice.

To sum up, in making an attempt to diagnose cholera one should have the knowledge that the sick animals have been exposed. This, together with at least some of the symptoms mentioned and a record of high temperatures, will aid considerably. The next step would be a post-mortem examination. If the animal has been dead for some hours, it is better to kill one that is in the last stages of the disease. Decomposition begins rapidly in warm weather and this may cause such changes in the carcass as to make the signs of cholera unrecognizable. It is sometimes necessary to

destroy two or three pigs before finding one which shows distinct signs of cholera.

The post-mortem examination

Whenever possible, the post-mortem examination should be performed by an experienced person, preferably a veterinarian. If the owner of the hogs must do it himself, a few suggestions are offered. Open the hog as soon as possible after it dies. Lay the animal on its back and examine the skin for purple spots on the belly or inner sides of the legs.

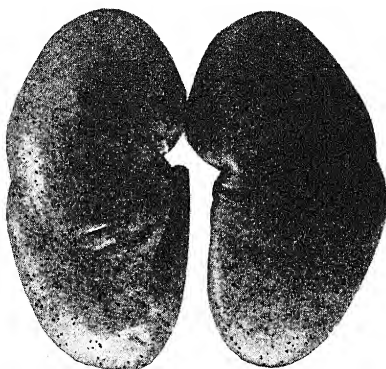


FIG. 22.—Pair of kidneys from a hog dead of cholera. The black specks are typical of this disease.

Slit the carcass from throat to tail and lay aside the flaps of skin, so that the internal organs may be reached easily. Proceed carefully and do not cut everything in sight. Remove each organ separately and set it aside for later observation. Continuing in this manner, take out the intestines, spleen, lungs, liver, heart, kidneys, and bladder, being careful not to cut into

them unnecessarily. Keep the intestines intact and try to avoid cutting into them at this time, so the carcass will not become soiled with manure.

After the internal organs have been removed, each should be carefully examined for small pin-point hemorrhages. These spots are red or even black in color and range in size from the head of a pin to as big as a pea. Such small hemorrhages are often spoken of as petechiæ. In examining the carcass one is constantly on the lookout for these hemorrhages on the various internal organs. The lungs, which are normally pink in color, may be examined first. If the dis-

ease is cholera the reddish spots may be observed on its surface. When pneumonia is present, portions of the lung may be solid or liver-like in consistency. When the heart is examined, the thin covering should be removed and the surface of the organ scanned for the same red spots. The liver does not usually show changes that are characteristic of cholera. The spleen or melt may be increased in size and sometimes shows dark areas as large as a quarter of a dollar. The kidneys frequently present a turkey-egg

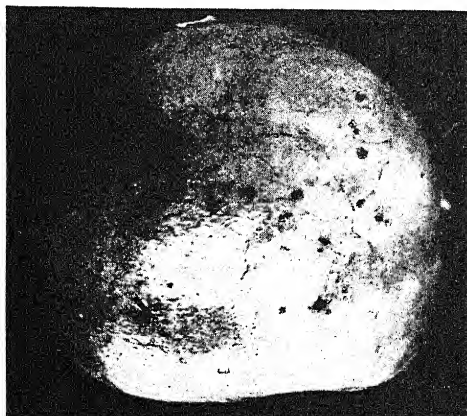


FIG. 23.—Inside of bladder of hog showing the hemorrhages. The spots are dark red or black in color.

appearance, being dotted with red spots varying in number from a few to several hundred (Fig. 22). The bladder is cut open and turned wrong side out. If cholera is present, the inside may contain small red spots or hemorrhages (Fig. 23). The contents of the stomach are emptied and the inside surface examined for red spots or a diffuse reddening. The small intestines may be inflamed, reddened, or dotted with red spots. The large intestines may appear much the same as the small intestines, while in the chronic

or long-drawn-out cases button ulcers may be found near the place where the small intestine enters the large one. Button ulcers are present only in the chronic cases. These are round hard areas and are yellow or yellowish-red or brown in color. They range in size from $\frac{1}{4}$ to 1 inch in diameter. The lymph-glands are often affected, the most important ones to be examined being located in the angle of the lower jaw and in the fat of the belly in the region of the flanks or groin. These glands are grayish-white when healthy, but if cholera is present they may be red or black and when sliced with a knife they may resemble a cut strawberry.

In most cases the carcass of a pig dead of cholera does not show all the changes mentioned. Perhaps only the kidneys and bladder may show hemorrhages that can be considered indicative of cholera. When the signs of cholera are not well defined it is necessary to take into consideration other facts as mentioned before, namely, how long the herd has been sick, how many animals have died, has there been a history of exposure to cholera, has the herd been recently vaccinated, has any new stock been recently purchased either from neighbors or from a public stockyard and also whether hog cholera has been reported on nearby farms. All these facts are sometimes necessary to establish a positive diagnosis. This is especially true when the symptoms are not well defined and the post-mortem examination fails to present typical signs of cholera. When all the symptoms and signs are clearly defined, cholera is relatively simple to recognize, but when they are not it is one of the most difficult diseases to diagnose.

Treatment

There is no successful cure for hog cholera. From time to time many cures are offered, but all have been found wanting, and no farmer should put any dependence in them. Minerals, tonics, and the like are frequently guaranteed to prevent and cure cholera, but they, also, are worthless for

this purpose. The only sane way to handle an outbreak of this disease is to use anti-hog-cholera serum. Even this is not recommended as a cure for the pigs already affected, but should be used as a preventative. The farmer who waits until his herd is sick before using this method of prevention is usually disappointed in the results, for many animals die in spite of the vaccination. Serum is sometimes injected into pigs sick of cholera in the hope that it will pull a few of them through. While some animals apparently recover after such treatment, no assurance can be given that it will always be effective.

There are two methods of preventive treatment. One is known as the serum-alone or single treatment, while the other is called the serum-virus, simultaneous, or double treatment. The single treatment is not as popular as formerly, because it gives the treated animals a short-lived immunity, usually lasting about a month or six weeks. The single treatment is also used to immunize healthy hogs or to treat animals in the early stages of the disease. It cannot cause cholera because the serum does not contain any of the germs of this disease. The single treatment is of value in cases in which only a temporary immunity is desired. It may be used when pigs are to be shipped, to protect them while in transit, to treat sows in advanced stages of pregnancy, or to treat a herd which is not in good enough condition to withstand the shock of the double treatment. Some owners object to the double treatment of suckling pigs and, for this reason, small pigs are often single-treated to protect them until after they are weaned. This method necessitates continuous retreatment once every month or six weeks or the application of the double treatment a month after the single treatment, if permanent immunity is desired. The single treatment has its advantages and disadvantages. It is safe but short-lived, while the double treatment immunizes animals for life. The cost of either is approximately the same.

The double treatment involves the use of both serum and

virus. The serum itself does not contain the germs of cholera, but the virus is the live germ of cholera and, therefore, should be handled with care. The serum and virus are injected at the same time and if the herd is healthy the immunity secured is lasting and seldom an animal becomes sick of cholera afterward. The double treatment is popular because it protects the pigs for life and is cheaper in the end. There is, however, an element of danger because of the use of virus. Some states do not permit the general use of the double treatment, fearing that it will spread the disease still further.

Anti-hog-cholera serum and virus

The serum is secured from hogs that have been especially immunized against this disease. It is made in laboratories under the direct supervision of the Department of Agriculture and is a safe means of hog cholera immunization. Two common kinds of serum are in use. One is called bloody and the other clear serum. Both are effective in preventing hog cholera. Inasmuch as the clear serum is nothing more than refined bloody serum and costs only slightly more, this type would appear most desirable. In clear serum the red blood-corpuscles are removed.

Whenever disaster follows the treatment of hogs with serum, it is common to hear a complaint that the serum was bad. Bad serum as such is rarely, if ever, sold. It may spoil when improperly stored and thus cause trouble, but when it leaves the laboratories all of it is good. Serum and virus should always be kept in an ice-box or at least in a cool place and should not be ordered a long time before it is needed. If the herd is vaccinated and some of the animals die, it is well to look for some other cause. Perhaps the herd was infected at the time of vaccination and the owner or veterinarian was not aware of it. The serum treatment is often condemned because the user is not familiar with its limitations.

Hog-cholera virus is prepared from the blood of hogs that

are sick of cholera. The animals are bled when they are in the last stages of the disease, the blood removed, treated, and put up in bottles for future use. Virus may sometimes be ineffective if it should become impotent or die. To perform a successful double treatment, the virus must be virulent or alive and able to produce the disease if injected alone into healthy pigs.

The user of serum and virus should purchase these products from a reputable firm and store them in a cool place after their receipt; never buy serum or virus from a peddler. After the herd is vaccinated the empty virus bottles should be disposed of by burying or burning. They contain the live germs of cholera and might cause trouble if carelessly thrown away.

Vaccination of hogs

Many states do not allow farmers to vaccinate pigs for cholera. This regulation usually refers to the double treatment. Virus is actually bottled hog cholera and many state officials fear that careless use will serve to spread the disease. Other states permit the general use of serum and virus by farmers and veterinarians alike. Some states allow farmers to double-treat their own hogs after they have attended a short school of instruction and have secured a permit from the state live-stock authorities. The farmer who contemplates the vaccination of his herd for cholera should make inquiries from his state agricultural college as to the necessary requirement. In most cases it will be safer and fully as cheap to have the work done by a qualified veterinarian. His long experience with such practices will usually insure satisfactory results.

The herd should be taken off feed about twelve hours before the hogs are to be treated. They should be placed in an inclosure where they can be caught easily without exciting them unduly. It is best to vaccinate in the early morning hours. The farmer should provide himself with a set of instruments which are boiled carefully and wrapped in

a towel to keep them clean until they are used. A table or box should be brought on which to lay the instruments and disinfectants, covered with clean towels or an old tablecloth. A bottle of tincture of iodine is useful to disinfect the skin at the point of injection. A pail containing a good disinfectant solution is needed to keep the instruments and the hands of the operator clean during the progress of the work. If the pigs are not badly soiled with mud, the skin may be painted with the iodine just before the serum or virus is injected. Dirty pigs will need to have their skin washed before the needle is introduced. The serum should be left in the bottle containers and drawn into the syringes through a special filling tube designed for this purpose. Under no consideration should the serum or virus be placed in a bowl or dish. Cleanliness in all phases of the operation will prevent the formation of abscesses. Each time after the serum syringe is filled, a clean needle should be slipped in place. The supply of clean needles may be kept in a pie-tin filled with some of the disinfectant solution.

There should be plenty of help to catch and hold the pigs. The man doing the vaccinating should not be expected to catch pigs and operate the syringes also. It is his business to keep clean and do clean work, but he cannot do this if he is forced to stop work at intervals to assist in holding a pig. The one doing the actual vaccinating should have on a clean suit of overalls and keep his hands clean at all times during the treatment.

The temperature of at least a dozen hogs should be taken immediately before the herd is treated. This will help to make certain the herd is in good condition and also to identify those pigs showing temperatures. If some show a high fever, the temperature of all the pigs should be taken and each feverish one marked with a daub of iodine on top of the head. Such pigs should receive more than the customary dose of serum. It is not uncommon to find a herd which appears healthy but has several pigs carrying temperatures. If this condition is not known, these pigs may die and the

serum treatment blamed for the loss. Serum is used on such pigs with the understanding that they may die if the rise in temperature is due to cholera.

Heavy hogs may be snared by the lower jaw and tied to a convenient post. The injection is then made in the loose folds of skin in front of the shoulder and back of the ear.



FIG. 24.—Arm-pit method of vaccination. The assistant holds the pig firmly between the knees.

Pigs weighing up to 90 or 100 pounds may be injected in the loose tissues of the flank or arm-pit. They are held by either the front or hind legs depending on which place is selected for the injection. Animals of ordinary size, from 100 to 150 pounds, may be placed in a trough or secured on the ground and the serum injected into both flank and arm-pit (Fig. 24). Injections into the ham should be

avoided. If abscesses form at this point they are very difficult to open and drain satisfactorily.

The skin at the point of injection should be painted with iodine before and after the serum or virus is injected. When the needle is withdrawn, the skin puncture should be pinched to prevent the escape of the serum or virus. Not more than 30 or 40 cubic centimeters of serum should be injected into one place. When more than this amount is necessary to immunize a pig, it should be distributed in two or three other places. The virus is injected at some distance from the serum. If the serum is injected into both flanks, the virus may be injected in the arm-pit.

As a rule, it is sufficient to follow the dose table given on the serum bottles. There is, however, a tendency to under-guess the weights of pigs and for this reason animals may sometimes receive an insufficient amount of serum. A good general rule for either the single or double treatment follows: all pigs up to 60 pounds in weight receive 30 cubic centimeters of serum and pigs from 60 to 200 pounds receive one-half their weight in cubic centimeters. This means that a pig weighing 150 pounds will receive 75 cubic centimeters of serum. All pigs 200 pounds or over receive a maximum dose of 100 cubic centimeters of serum. These doses apply to healthy herds only.

If the herd is sick of any disease at the time of vaccination, all the animals should receive a dose and a half of serum; a 100-pound hog in a sick herd should be given 75 cubic centimeters of serum. Full dosage will always insure a greater margin of safety. Pigs never die from an overdose of serum, but hundreds, no doubt, have died because they received too little.

The dose of virus is very small in comparison to the serum. Pigs under 100 pounds receive 2 cubic centimeters of virus while those over that weight are given 3 cubic centimeters.

The serum treatment should not be expected to cure sick pigs. These may be vaccinated in the hope that some will

recover, but most of the infected pigs die, especially if they are in the advanced stages of cholera. Full doses of serum and virus should be given all the animals in a sick herd and a dose and a half of serum for better results.

A herd of pigs affected with worms, flu or necro should not be double-treated except in an emergency. Such herds may be vaccinated with the understanding that the results cannot be guaranteed and that some of the animals may die. To secure the best results with the serum and virus treatment, it must be used on healthy herds.

Care of the herd after treatment

A vaccinated herd need not appear sick after the treatment is administered. Some farmers think the vaccination "takes" better if a number of the animals are ill the next day.

The vaccinated herd should not be allowed to run in muddy lots after treatment. If the weather is fine, they are better in a pasture with some shade. The feed should be restricted for a week or two after vaccination and corn used sparingly. In about two weeks the herd may be placed on full feed.

When animals are single-treated, it is not necessary to quarantine the herd, but when the double treatment is applied the premises are quarantined for about a month. This means that no pig may be taken from the farm during this time. The ban is lifted when proper clean-up methods have been instituted and at least three weeks have elapsed since the last hog died.

Sometimes a few pigs die after the herd is vaccinated. If such losses are caused by the treatment, the pigs will start to die within ten days after they are vaccinated. When losses occur at such a time, it is often termed a "serum break." This means that the virus was potent or strong, but the serum was either of insufficient strength or not enough was given to offset the effect of the virus. Most serum breaks are caused by insufficient dosage of serum, or

the herd was infected with cholera when vaccinated, even though they appeared all right at the time. A herd badly affected with necro, flu or worms might come down sick with cholera after being treated and the serum blamed for the loss.

Virus or late breaks refer to losses that occur several weeks or months after the herd was double-treated. In many cases they are very difficult to explain to the owner's satisfaction. The virus may not have been potent and, as a result, the herd was only singly treated. The serum protected them for some time, but later the infection reached the herd and some of the pigs became infected and died. In both serum and virus breaks the entire herd should be treated again with liberal doses of serum alone.

Abscesses or swellings containing pus are sometimes encountered a few days after vaccination. If this trouble is general throughout the herd, it indicates very careless work, usually pointing to dirty instruments, contaminated serum, soiled needles, or the practice of allowing the pigs to run in muddy lots after they are vaccinated. Abscesses always mean infection and the presence of pus is certain proof of a dirty operation. It is usual for the operator to blame the serum and, as a result, most serum manufacturers are besieged with such complaints during the summer months. The owner is assured that serum is blameless in most cases unless it is carelessly handled during the vaccination. It should never be poured from the bottle into a bowl, because it usually becomes soiled with dust and dirt and frequently leads to abscess formation. Keep the serum and instruments clean, place the herd on clean pastures after they are treated, and abscesses will be conspicuous by their absence. When abscesses occur, they should be opened with a sharp knife and drained.

Treatment of suckling pigs

There appears to be some misunderstanding about immunity in suckling pigs. It is generally stated that

suckling pigs are immune while they are sucking a mother that has been previously immunized by the double treatment. This requires further explanation, because the mother must have been double-treated before she was bred if she is to be expected to confer any immunity to her offspring. Some owners of hogs have complained that suckling pigs died of cholera, but fail to state that the sows were double-treated while they were pregnant and often very near farrowing time. The double treatment of sows that are nearing farrowing is always fraught with danger, because they may give off infection in their milk and thus cause the little pigs to become infected soon after they are born. The only safe way to prevent this sort of infection is to make sure that all the brood sows are double-treated a month or two before they are bred. This will enable them to develop their own immunity and thus be able to transmit some to their young. This immunity lasts only while the animals are suckling.

If cholera is in progress at the time the sow farrows her litter, the young pigs must be treated with serum alone at once. This will protect them until they are weaned, at which time they may be double-treated.

When there is no immediate danger of infection, small pigs may be double-treated regardless of age. The small pigs must, however, receive a full dose of serum and virus and if the operation is conducted properly few of the treated pigs will thereafter contract cholera. Such pigs should be healthy and free from disease when they are treated. When the small pigs are not in good condition, it will be safer to administer the serum-alone treatment and repeat with serum and virus a month or six weeks later.

While very small pigs may be double-treated if in good health, it is better to withhold treatment until about a week before they are to be weaned. They may be handled easier, the cost will be slight, and the owner is assured of ample protection early in the lives of the pigs. Thirty cubic centimeters of serum are best for pigs up to 60 pounds in weight.

Two cubic centimeters of virus are sufficient for pigs weighing from 30 to 60 pounds.

The owner of a herd whose brood sows are regularly double-treated has little to worry about. The small pigs are protected while they are sucking and just before weaning they may be double-treated with safety.

Treatment of pregnant sows

Sows should always be double-treated before they are bred. If infection is present in the herd, they must be treated regardless of the state of pregnancy. It is the general practice to avoid double treatment of pregnant sows that are very near farrowing time. If cholera threatens a herd at this time the sows may be single-treated and double-treated later on. It should be remembered that the single treatment of the sows will not protect the pigs when they are born and they should be promptly single-treated soon after they are farrowed.

So far as abortion is concerned, it does not make any difference whether the treatment is single or double, for the percentage of abortions following vaccination is about the same in either case. When abortions occur after treatment, it is probable that the rough handling had as much to do with the trouble as anything else.

SWINE PLAGUE

Swine plague or hemorrhagic septicemia is an infectious disease of swine caused by a specific germ which is found normally in the air passages of many healthy hogs. The germ is usually harmless unless the vitality of the animal is lowered by some other disease such as hog cholera, necro, worms, or flu. Improper feed and care may also weaken pigs to such an extent that the germs are able to overcome the natural resistance of the animals and produce disease. Some investigators refuse to accept swine plague as a distinct infection which is able to kill pigs unaided by some other disease or condition which first weakens the animals and paves the way for the plague germs to multiply.

The symptoms of swine plague are never clearly defined and it is very difficult for veterinarians to distinguish this disease from hog cholera, especially when one is complicated with the other. Some observers consider swine plague secondary to hog cholera, in that it does not become dangerous to animals until they are first weakened by the attacks of the cholera germ. After this it may be able to gain headway and cause death. The visible symptoms of swine plague are almost identical with hog cholera, the animals showing loss of appetite, rapid breathing, and coughing. The temperature of pigs affected with cholera is usually higher than that in simple uncomplicated cases of swine plague.

The examination of the carcass of a dead hog does not reveal changes that will differentiate swine plague from hog cholera. Pneumonia is described as a fairly constant sign of swine plague, but this is also found in hog cholera when the lungs are affected. The other internal changes of swine plague so closely resemble hog cholera that experts often fail to distinguish between the two.

The treatment of swine plague is very unsatisfactory because of the uncertainty in diagnosis. If animals were actually suffering from a straight case of swine plague pneumonia, good nursing, clean quarters, fresh air, and careful feeding would be effective treatment. Unfortunately, swine plague and hog cholera are confused to such an extent that many believe that when swine plague occurs, hog cholera is also present and is in reality the cause of the disease. The usual recommendation when doubt exists as to the identity of the disease is to consider and treat it as hog cholera. Vaccines and serums are offered to prevent and cure this disease, but they have not found wide acceptance.

INFECTIOUS OR NECROTIC ENTERITIS (NECRO)

Necrotic or infectious enteritis of swine is a widespread disease affecting all breeds. Pigs under six months of age are most often affected. This disease is frequently called "necro," a nickname for the germ which was formerly

thought to be the sole cause of the infection. Necrotic enteritis belongs to the group commonly referred to as soil-born or filth diseases. The germ causing it is a constant inhabitant of dirty and long-used hog lots. This disease is becoming prevalent in the corn-belt and causes tremendous losses each year. Relatively simple methods of prevention have been outlined, but these do not take hold rapidly, because they entail a revolution in the usual farm practices at farrowing and weaning time. This disease and the three following comprise the group popularly called necro. The reader should consult the other forms, because two or three of these infections are frequently seen in the same herd at the same time.

Cause of infectious enteritis

The common name of necro usually applied to this disease has led to some confusion as to the cause. Until recently it was believed that a very ordinary germ called *Bacillus necrophorus* was the cause of infectious enteritis. This assumption was based on the fact that this germ was found in practically all outbreaks of this disease. Murray and others, of Iowa, have since shown the real cause to be an organism or germ which goes by the name of *Salmonella suipestifer*. They have also demonstrated that *Bacillus necrophorus* is merely a secondary invader and not the primary cause of the disease. The *Salmonella suipestifer* germ first injures the lining membrane of the intestines and *Bacillus necrophorus*, which is almost always found in the intestines of healthy hogs, enters the injured portion of the intestines and multiplies there.

Symptoms

As stated before, this is a disease of young pigs, a number of which may be affected at the same time. As the name indicates, the disease is characterized by a severe inflammation of the intestines and this in turn causes a diarrhea which is usually one of the common signs of this

infection. At first the appetite of the affected pigs may not be lessened, but as the disease continues the desire for food is gradually diminished and the animals begin to show signs of unthriftiness. They are often called runts because of their thin and pot-bellied appearance. The pigs slowly become weaker and frequently weave as they walk. As a rule, the sick pigs do not have a high fever. The skin becomes harsh, dry, wrinkled, and leather-like. Many of the affected pigs die from exhaustion, resulting from the loss of flesh and the drain of the constant diarrhea. Some of the animals may be sick only a short time while others may last for several weeks. The symptoms are persistent diarrhea, loss of flesh, and general unthriftiness. When seen in small pigs the indications point to this infectious diarrhea. The post-mortem examination would fix the diagnosis beyond doubt. The reader is again cautioned to avoid snap judgment on the symptoms shown by a sick pig, because up to a certain point all look much alike. The examination after death usually fixes the blame.

When a small pig dies after showing the symptoms just mentioned, the carcass should be opened and the stomach and intestines examined carefully. A knife or scissors will serve the purpose of opening these two organs. First, the stomach is removed and emptied of its contents. While the stomach is not the place where the greatest changes occur, it often presents a cooked appearance when a pig has suffered a long time from this disease. The intestines should then be opened and examined from end to end, looking for patches of dead tissue. These patches are really part of the lining membrane of the intestines. They vary from the size of a quarter to as large as one's hand and may even involve several feet of the bowel. A crude description would be to compare the inside of the intestines with the corroded inside of a long-used water pipe. When scraped with the knife-blade the entire lining of the intestine may come off easily. The affected patches may be white, yellow, or brownish in color. Sometimes round ulcers similar to those

often encountered in chronic hog cholera are found. In severe cases of infectious enteritis, the inside of the intestine appears about to slough off. The first or beginning spot is an ulcer which increases in size until it takes in a large area.

The owner of sick pigs should always remember that hog cholera should be eliminated from consideration when attempting to determine the cause of the disease at hand. The differences here mentioned will aid in distinguishing between the two diseases. In necrotic enteritis the course of the disease is likely to be much slower than in cholera and the pigs do not show the typical high temperature that usually accompanies cholera. Pigs suffering from cholera often exhibit purple blotches on the skin of the insides of the legs and belly, which condition is absent in enteritis. Pigs affected with infectious enteritis become very thin, weak, and usually have a persistent diarrhea. In cholera the onset of the disease is sudden and many of the sick animals die while still in excellent condition after an illness of only a few days. Infectious enteritis affects young pigs chiefly, while cholera may attack animals of all ages.

When examined after death, cholera hogs may show the usual pin-point hemorrhages on the various organs of the body. The reader should consult the post-mortem description given under hog cholera. Cholera does not show the extensive areas of dead tissue on the lining of the intestines.

Treatment

The treatment for infectious enteritis is very unsatisfactory. Small pigs that have suffered from the disease for a long time are not likely to be greatly benefited by any sort of drug and death usually follows after a prolonged illness. It is customary to administer any one of several intestinal antiseptics, but it is doubtful whether they do very much good. They are given more often to satisfy the demands of the owner rather than to effect a cure.

In some cases the course of the disease may be arrested

by the removal of the pigs to other clean quarters or pastures, but if they have been sick for long their growth is usually permanently retarded and it is unlikely that they will ever make much money for the owner, even though they eventually reach the market. It should be kept in mind that this disease is a soil infection and is directly associated with unsanitary hog lots. It does not seem reasonable to expect to cure pigs sick of this disease if they are kept continuously on such infected ground.

There are innumerable cures for this disease. All are guaranteed, but none will stand the test. Tonics, minerals, and other panaceas are never recommended by individuals not interested in the sale of such preparations. Minerals, no doubt, have their place in rational live-stock feeding, but no sensible person can reasonably expect to cure or prevent an infectious disease by any such means. Clean hog lots are worth more than any medicinal treatment available.

How to prevent necrotic enteritis

Necrotic enteritis, as pointed out previously, is a disease of filthy hog lots. It affects small pigs under six months of age. It is also incurable. With these facts in mind, the owner of young pigs should take pains to protect them from infection. Hog lots that are known to be heavily seeded with the germs of this disease should be avoided. If the disease was present the year before, it is likely to appear the following season. Wet low-lying hog lots are always dangerous, because wet soil acts as an ideal incubator for the growth of these disease germs.

Most pigs possess considerable natural resistance to infection, but when they are forced to live in such filthy lots their ability to throw off infection is reduced to such an extent that they are unable to withstand the massed attack of millions of these germs. When one observes the conditions under which some pigs are forced to exist, one may well wonder that any of them are able to survive at all. Clean mud never hurts pigs; it is the accumulated filth of

generations of hogs gone before that makes the old hog lot a menace to the young crop. A pig is one of the very few animals that must take its meals in its own manure. It is, therefore, a source of speculation that any of them reach a market.

Any lot adjoining a permanent central farrowing house soon becomes so laden with the various infections of hogs that it is a gamble as to how many pigs will pull through. The germ of this particular disease passes from the sick pig in the manure and when numbers are affected the yard quickly becomes a hotbed of disease and a source of great danger to healthy susceptible pigs.

To guard against this disease, the owner should make an extra effort to keep the little pigs away from the old lot until they are six months of age. After this there is very little danger. Provide a clean farrowing pen for the sow. Scald the floor of the pen with boiling water before the sow is put in. Bed her down with a foot of clean dry straw and replace frequently. Scrub the belly of the sow thoroughly with ivory soap and water. The ivory soap is preferred because it floats in the pail of water. Soon after the litter is farrowed and weather permits, the sow and her young should be transported to a clean pasture. Alfalfa or sweet clover are excellent. Keep the sow and litter there until the little pigs pass six months. After that the owner will be so agreeably surprised with their appearance that he will not consider their return to the old infected lots.

The idea should be abandoned that a dirty infected hog lot can be made safe by the application of any of the common disinfectants. They do absolutely no good when sprayed about the ordinary yard. One might make the lot smell a little better, but very little, if any, real disinfection would be done. Many hog-raisers salve their conscience when they turn a number of small pigs over to the tender mercies of a badly infected hog lot by scattering a coating of lime over the soil. The man who tries to cover up infection in this way is seldom, if ever, benefited. The only

known way to clean up a dirty hog lot is to abandon it for a few years and let sunshine do the work of cleaning up.

Thousands of farmers are using the small portable farrowing house with success. It means later farrowing, of course, but most farmers would be better off if their sows did farrow later, because they do not have proper equipment for the early litters, and during long wet cold springs the pigs must be kept inside too long. The early litter may reach the market if it lives, but many growers of swine pay too big a price in their struggle to reach the early fall market. Later litters on clean ground mean more and healthier pigs.

NECROTIC RHINITIS OR BULL-NOSE (NECRO)

Bull-nose is another form of necro and derives its name from the swollen and thickened appearance of the snout. As in necrotic enteritis, this disease affects little pigs chiefly, being seldom, if ever, seen in animals over six months of age. In some cases the head of the pig is so badly disfigured as to make it almost unrecognizable. When there is a chronic discharge from the nose, the disease is often called snuffles.

Cause

This type of necro is native to long-used and badly infected hog lots. While one or two specific germs have been blamed for this disease, it is possible that almost any of the common germs found in old yards may be responsible, when given the opportunity. Bull-nose is a filth disease and is seen most when pigs are raised in central lots that are soiled by the manure of many generations of older hogs.

This disease is primarily a wound infection. As a rule, a cut in the skin about the nose is necessary before the germs are able to enter and multiply. The rooting habits of pigs make small cuts very likely to occur and these furnish an ideal mode of entrance. Infection may also enter when pigs are "ringed" or when the teeth are clipped off. The prac-

tice of clipping the teeth of small pigs is entirely unnecessary in most cases and should be discontinued. Some hogmen think it is an ill omen when a small pig happens to have a black tooth. The teeth should be left alone, regardless of their color. The black tooth is simply a baby tooth ready to fall out. During the tooth-clipping operation, the



FIG. 25.—Pig affected with the bull-nose of necro. Such animals should be disposed of rather than treated.

gums are frequently left cut and bleeding, and it is not difficult to see why infection enters after such careless operations. More will be said later about the practice of clipping teeth.

Regardless of how the infection enters, this disease seldom appears when young pigs are raised on clean soil away from the old central hog yard.

Symptoms

The early stages of this disease probably pass unnoticed until some of the pigs sneeze or show small ulcers about the nose. The refusal of the pigs to nurse may lead to investigation. The inner lining of the nose becomes affected and swelling follows. The germs may even penetrate the inner recesses of the nose and cause a swelling of the face and a discharge of sticky foul-smelling pus-like material. In the meantime the head may take on a bulged appearance. When very small pigs become infected, they lose weight rapidly because they do not nurse regularly on account of the soreness of the nose. As a result they quickly become runts and usually die.

When older and stronger pigs are diseased, the head may become so large and disfigured as to resemble the trunk of an elephant (Fig. 25). The front of the face loses its shape when the bones and cartilages of the head become diseased. If the facial swellings are cut into, they will usually be found to contain pus. As the swellings about the nose increase in size, the passages of the nose close and often make breathing very difficult. After a time the ulcers become raw bleeding sores and the animal presents a pathetic appearance. The owner of small pigs which show swellings, ulcerations, and scabs about the nose may be sure the animals are suffering from necrotic rhinitis or the nose form of necro.

Treatment

When the head is very badly swollen and shapeless, the most humane treatment would be to destroy the animal.

Any treatment to be really effective must be used in the early stages of the disease when the ulcers or sores about the nose are very small. Even these small sores require persistent and painstaking treatment. If the owner continues to keep the pigs in the same infected yards, treatment might as well be omitted. The raw sores should be scraped until all the diseased and dead tissue is removed and until clean flesh is reached. If the sores are small they should be burned with a stick of lunar caustic or painted with full strength tincture of iodine. The sores must be treated daily by continuing to remove the accumulations of dead flesh. If the caustic is not available, any good antiseptic solution may be substituted. A 10-per-cent solution of nitric acid applied with a cotton swab has given good results. Any application to be successful should be used only after the scabs and dead tissue underneath are scraped away. In the meantime the pigs should be placed on clean pastures. If the bones of the head are diseased and the breath is foul, the best advice is not to attempt treatment at all.

Prevention

To prevent the nose form of necro, the suggestions for the prevention of necrotic enteritis should be followed. Allow the sows to farrow later in the spring. Use colony houses placed in clean pastures. Pigs on clean alfalfa fields do not often suffer from bull-nose. Nothing will prevent this disease but good sanitary practices.

NECROTIC STOMATITIS OR SORE MOUTH (NECRO)

This is still another form of necro. It is very common in the corn-belt and affects young pigs only (Fig. 26). Sore



FIG. 26.—Sore mouth in a small pig. Note large sore on jaw and diseased lips.

mouth is a filth disease and is very rarely seen outside of dirty hog lots. The common name for this disease is canker.

Cause

Almost any of the usual assortment of germs found in the old hog lot may cause sore mouth. This disease is also a wound infection, the germs entering through cuts in the skin about the lips and gums. The rooting habits of the pigs

increase the chances for wounds or scratches of this nature. Clipping teeth, black or white, may injure the lips and gums and thus open the way for infection. Improper feeding has nothing to do with the occurrence of this trouble.

Symptoms

Suckling pigs suffer most. Few farmers pay much attention to sore mouth until the disease gets a good start. The infection may start through cuts from pigs biting one another. Later on the sores begin to form, causing the animals to suck with difficulty, especially if the tongue and inside of the mouth are affected. In such cases the breath of the sick pig is usually foul. The affected pigs will soon refuse to nurse or eat. Some of them will hold their mouths open to relieve the irritation and many show evidence of great thirst. The cooling effect of the water passing over the sores probably is the reason for the desire to drink frequently. If the inside of the mouth and lips are examined, ulcers may be found on the tongue and insides of the cheeks. This condition is very painful and causes the animals much suffering. After a time the pigs lose condition from failure to nurse or take solid food and many actually die of starvation.

Treatment

If the inside of the lips and mouth, cheeks, and tongue are badly ulcerated, treatment is not indicated. Some advocate washing the mouth with a solution made by adding 1 ounce of potassium permanganate to 1 gallon of water. This might be effective in very mild cases.

A few ulcers on the tongue or lips may be scraped to the quick and touched with full strength tincture of iodine. The 10-per-cent solution of nitric acid should not be used inside of the mouth but may be employed on the outer sores of the lips. Mild cases may be treated as described. Pigs with extensive sores should be disposed of, because the treatment requires too much time and the chances are

that the affected pig will develop into a runt from the long period of starvation.

Prevention

The problem is to keep small pigs out of the mud and filth of the old hog lots until they outgrow their susceptibility to this infection. After six months, the pigs are reasonably safe from infection. If the directions for the prevention of necrotic enteritis are followed, sore mouth will seldom occur. A clean sow in a clean pen will be an asset. As soon as possible the mother and her litter should be moved to clean pastures, or better still, allow the sows to farrow later in the spring when colony houses may be used. If the pigs are kept away from the old infected yards, sore mouth will be rare.

NECROTIC DERMATITIS OR SKIN SORES (NECRO)

This is the fourth and last type of necro. It, as usual, affects pigs under six months of age, being seldom observed in older animals. It is more common during the spring and summer months. Rainy weather favors all varieties of necro when the little pigs are allowed the run of old yards. Any of the common hog-lot germs may at times be a source of infection.

The body sores found in this form of necro originate from an infection which enters through abrasions or cuts in the skin. Certain specific germs have been isolated from these sores, but it is probable that any one of a great number found in old hog lots may cause the disease. Wounds or cuts are necessary before the germs can enter.

Symptoms

The signs of this disease are ulcers on any part of the skin. The ears, tails, legs, and feet are often infected (Fig. 27). The ears and tails are sometimes so badly diseased as actually to fall off. The sores are usually covered by a brown or black scab. The infection eats away

the tissue underneath, leaving deep pits when the scabs are removed. When the infection centers around a joint, lameness frequently results. The affected leg may be swollen and stiff. The feet may become involved and the flesh between the toes decays much the same as foot-rot in cattle or sheep. The owner should have no difficulty in recognizing this disease by the sores on any part of the skin.

Treatment

If the disease is recognized early, when the sores are few, satisfactory treatment may be undertaken. The affected,



FIG. 27.—Pig with enlarged joints and skin sores of necro.

as well as the healthy pigs, should be removed to clean pastures. If the sores are very extensive, the treatment will not be effective and those animals whose skin is covered with scabs should be destroyed. In mild infections many pigs may be saved by careful treatment. Remove all the scabs and scrape away the dead tissue underneath. Apply full strength tincture of iodine to the clean surface of the sores. The 10 per cent nitric acid solution might be used on small spots but is not to be employed on large areas of infection. Care should be exercised to keep the acid solution from touching healthy skin. Apply either solution with a

abort from ordinary bumps and bruises, but some doubtless abort during the course of certain infectious diseases.

From available information and observation it is evident that when several sows in a herd lose their pigs before term, it is due to a specific infection. Recent investigations of such outbreaks show that there is contagious abortion in swine. This disease appears to be increasing, especially in the thickly populated swine sections of the United States. A single abortion may not point to the presence of this disease, but whenever several sows lose their pigs, the owner should take steps to find out whether his herd is infected.

Cause

Contagious abortion in hogs is caused by the same germ that produces the disease in cattle. Swine doubtless acquire their infection from contact with an infected herd of cows. The abortion germ enters the body from eating or drinking infected material and eventually finds its way into the womb or uterus. Here the germ multiplies and causes the membranes about the unborn pigs to become diseased. This frequently results in the premature expulsion of the little pigs. The germ of abortion disease has been found in the bodies of the aborted pigs, in the placenta or afterbirth, and in the milk from the udder of the infected sow. Reports show that the germ may sometimes be present in the testicles of an infected boar. True abortion disease is never caused by irregularities in feeding or a lack of minerals. Mineral feeding has become such an obsession to many growers of hogs that it is common to blame this disease to a lack of minerals in the diet.

Symptoms

There are no definite symptoms. The sow may appear perfectly healthy and the owner has no way of determining which animal in the herd is going to abort until the event actually takes place. Sows may abort at any time during the period of pregnancy. If the abortion occurs early, there

are usually no preliminary signs, but if the animal aborts as she nears full term she may show the usual enlargement of the udder and swelling of the vulva or external genital organ. Usually pigs are expelled easily and the afterbirth follows soon after. In many cases the sow shows a discharge from the vagina which sometimes lasts for several weeks. This persistent discharge is a result of an inflammation of the uterus which, if long-continued, may cause the animal to become a non-breeder.

Even with the absence of conclusive proof it is probable that the disease is often introduced into a healthy herd through the purchase of a sow already infected with abortion disease. While the germ of contagious abortion of cattle is apparently the same as that of swine, it has not been definitely established just how the infection is carried from cattle to hogs. It is possible that hogs may become infected from eating infected aborted calves, afterbirth, and also from contact with litter contaminated with milk or uterine discharges from diseased cows.

After the disease enters a healthy herd, sows may easily become infected from association with other diseased hogs. Some sows may be infected and able to spread the disease to others while they themselves give birth to apparently healthy pigs at full term.

When several otherwise healthy sows in a herd abort their pigs, contagious abortion should be suspected. The owner should at once get in touch with his local veterinarian and make arrangements to send one or two of the aborted pigs to a laboratory for a bacteriological examination. The finding of the abortion germ in the body of the aborted pigs would be conclusive proof that the sow was suffering from this disease. To be successful, such an examination should be made before the aborted pigs become decomposed. The aborted pigs should be carefully packed in sawdust and ice for safe shipment.

A reliable way to detect contagious abortion in a herd of hogs is to apply the so-called agglutination or blood test to

all the animals. It will probably be best to have a veterinarian secure the blood samples and send them to a laboratory for testing. If the owner desires to draw the blood samples himself, he should first provide enough clean 1-ounce bottles properly labeled with the name or number of each sow to be bled. An easy way to bleed the sow is to cut off the tip of her tail. Allow the blood to drip into the clean sterilized bottle and when about $\frac{1}{2}$ ounce of blood is secured the tail may be bound up with a piece of cloth to stop further hemorrhage. After the bottles are corked and labeled properly, they should be packed carefully in sawdust or wrapped in paper and sent to a laboratory for examination. It is customary for a nearby veterinarian or agricultural college to perform the test. The test is fully as accurate as that which is applied to cattle. When the report comes back, the owner will be able to sort out the infected animals and make arrangements for their disposal.

Treatment

There is no medicine or drug that will prevent or cure abortion. As mentioned, mineral feeding has no bearing on this disease and does nothing but create a false sense of security. A sow that gives birth to a litter of hairless pigs is not necessarily infected with contagious abortion. This is a different disease and is caused by the lack of iodine in the diet. Vaccination has been tried, but as yet it cannot be recommended to prevent or cure this disease. Animals with a persistent discharge from the womb should be treated in much the same way as described for retained placenta in cows, except that salt solutions should not be used for douching. Sterile sows should always be disposed of.

Management of the infected herd

The aborting sows should be placed by themselves, because they are very likely to spread the disease. Be sure to burn or bury the aborted pigs and afterbirth. Never, under any circumstances, allow other sows to eat such

material. Some farmers have been known to throw aborted calves in the hog lot to be consumed by the pigs. Such practices always lead to trouble sooner or later. Dead animals are never fit to be fed to other stock, but there seems to be a general impression that anything that dies on the farm can be fed to the hogs; many farmers have paid dearly for carelessness in this respect.

The next step is to have the entire herd tested to find out the extent of infection. After the first sow aborts, the remaining sows that are still with pig should be placed in as small groups as possible. This is done to stop the spread of the disease.

Aborting sows should be kept by themselves until all discharges have ceased. It is folly to expect the disease to disappear as if by magic when a discharging animal is allowed to mingle with the other sows due to farrow soon. If the aborting sow continues to discharge for a long time, it would be economy of time and effort to prepare and send her to slaughter.

Grade sows that react to the test should be disposed of. If the test reveals a widespread infection throughout the herd, the advisability of the disposal of all the infected sows might be considered, because there is no way of telling whether they will or will not abort again. The infected sows that carry their litters to full term may be a continual source of infection to other healthy animals.

If the herd is valuable from a breeding standpoint, the test may be used and the reacting sows kept separate from those that do not react. This method is similar to the plan used in controlling contagious abortion in cattle and would necessitate separate quarters for each group. This is merely a suggested measure and decision in this respect will rest with the owner of the herd.

TUBERCULOSIS OF HOGS

Swine tuberculosis was first identified in 1875. The disease doubtless existed before that time, but passed unrecog-

nized. Until very recent years the agricultural public has been so concerned in the control of tuberculosis in man and cattle that very little attention has been paid to the disease in swine. Most farmers do not consider the disease a serious handicap because few animals stay on the farm long enough to become visibly sick.

It was formerly believed that hogs became infected with tuberculosis from association with infected cattle only, and it was assumed that as soon as cattle were freed from the disease the percentage of infection in swine would automatically decrease. This has not been the case, however, because hogs derive much of their infection from a tuberculous flock of chickens.

Cause of swine tuberculosis

Tuberculosis in man and all animals is a specific contagious disease. While there are three common types of the tuberculosis germ, namely human, cattle, and chicken, the bulk of the infection in hogs comes from cattle and chickens. Hogs may be infected with the human type of the disease, but this source of infection is far from common.

The tuberculosis germ, regardless of type, does not grow or multiply outside the human or animal body. It may remain alive for long periods, but is not able to grow until it enters the body of man or animal. The germ is easily destroyed by heat, but is able to withstand temperatures far below freezing. The smoking or salting of tuberculous meat products does not kill these germs effectively.

The germs of tuberculosis enter the body of healthy hogs by way of the mouth, and swine sick of the disease pass off the live germs in the manure. Coughed up material from an infected lung is re-swallowed and passes out through the intestinal tract.

It is unlikely that hogs become infected to any extent from direct association with other diseased swine, but

rather through food or water which has become soiled with the germs from cattle, hogs, or chickens. The chance for infection from hog to hog is further reduced, because most of the infected animals are sent to slaughter before they become active spreaders of infection. An exception would be in the case of infected breeding animals. This is not to be construed that pigs are never infected directly from one another, but this method of transmission is thought to be relatively uncommon.

Milk from tuberculous cows may infect hogs. Infected bowel discharges from cattle and poultry are a common source of infection. Many farmers make a practice of feeding dead chickens and other live-stock to hogs, and this, no doubt, accounts for some of the spread of this disease. Refuse of all sorts and even table garbage may contain the germs. Fowl tuberculosis is very prevalent in the middle western states. As chickens eliminate the germs through their droppings, it is evident that this type of infection is a great menace to swine. In some instances hogs may show as high as 70-per-cent infection from the chicken type of tuberculosis. Hogs are very susceptible to either cattle or chicken tuberculosis and any effort to control the disease in swine must involve clean-up methods in both cattle and chickens.

The feeding habits of hogs make infection easy. A widespread adoption of a strict sanitation program applied to the raising of small pigs would probably have a tendency to reduce the infection in young animals especially. Such a sanitation plan would mean that the sows must farrow in clean pastures and the young pigs reared away from the old yards and farm buildings.

Symptoms

Many herds of hogs may be infected with tuberculosis while the owners are entirely unaware of its existence. If there is any suspicion of the disease, the owner may request

a report from the packing house as to the condition of the hogs shipped by him. He may be surprised to find that many of his pigs were infected with tuberculosis.

Most infected pigs do not stay on the farm long enough to become visibly sick. They often go to slaughter in good condition and may even top the market. When these animals are dressed the packer may find many of them infected and showing distinct signs on the internal organs. If pigs were held on the farm longer, many would show the usual symptoms of this disease. Even then these symptoms might be nothing more than loss of appetite, coughing, and gradual emaciation.

The examination of the carcass would show distinct changes which should enable a careful observer to identify the disease. Farmers who slaughter pigs for home consumption should be able to recognize the common changes in a tuberculous carcass.

The typical signs of tuberculosis are the finding of grayish or yellowish-white nodules or lumps on the various internal organs. These may be in any part of the body, but some organs are more likely to be affected than others. The nodules vary in size from a match head to an egg or even larger. When cut into with a knife, the inside of the nodule usually contains yellow cheesy material. As the knife passes through, a gritty sensation may be noticed. The liver and spleen (melt) often contain many of these nodules. Some pigs with this disease do not show extensive changes because the infection may be too recent. The intestines are not commonly affected, even though the tuberculosis germs enter and leave the body by this route. The lymphatic glands are probably affected more often than any other part of the body. There are hundreds of these glands throughout the carcass, but the ones located deep in the angle of the jaw and those located between the halves of the lungs are the easiest to find. In healthy hogs these glands vary in size from a lima bean to a hickory-nut, but when infected with tuberculosis they are much enlarged and

when sliced, have yellow cheesy centers. The lungs may show the same type of nodules as seen on the liver and spleen, but they are often imbedded in the lung tissue and are seen to better advantage when the liver is sliced in sections. The centers of the nodules are usually yellow. Sometimes the entire lung may be affected and appear as a tuberculous pneumonia.

Test for swine tuberculosis

Hogs may be tested for tuberculosis in much the same way as cattle. This test may be valuable in locating infection in a herd of breeding stock. The intra-dermal or skin test is used and gives excellent results. A small amount of tuberculin is injected into the skin at the base of the ear. The readings are taken twenty-four hours after the tuberculin is injected. If the tested animal is infected, there is a swelling at the point where the tuberculin was injected. Healthy animals show no change whatever. In reacting animals the swelling may remain for several days.

Treatment and control

There is no treatment for this disease and all efforts should be directed to prevent the further spread of the infection. The farmer may be fairly certain that the disease was derived from cattle or chickens.

Pigs may become infected by following diseased cattle or from infected milk products. The herd of cattle should be tested and all reactors removed. Swine should be raised apart from lots where the diseased cattle were kept. Milk from a suspected and untested herd should be pasteurized before use.

The farm flock of chickens should be tested and, if badly infected, it might be well to dispose of the entire flock and begin anew the following year. If hens die now and then, they should be examined for this disease. For a description of tuberculosis in poultry the reader is referred to Chapter XIX.

Some day it will be the practice to keep the farm flock of chickens in yards. Under the present system most flocks have the run of the whole farm and may spread the infection about the entire farmstead.

CHAPTER XVI

PARASITES OF SWINE

NEXT to sheep, hogs suffer more from both external and internal parasites than any of the other domestic animals. While body lice and mange mites seldom cause the death of many hogs, they are always a source of great annoyance to animal and owner. Hogs badly infested with lice or mites frequently become very unthrifty from the continual irritation of these pests, and if young pigs are attacked many of them become runts. The importance of skin parasites is usually under-estimated because their operations are not spectacular. There is a tendency to ignore them until the herd becomes so badly affected that the best treatment is often unsatisfactory. The control and eradication of parasites entails good sanitary practices and proper treatment of the affected animals. There are several simple home remedies for the eradication of lice and mites, any one of which will be effective when properly applied. Many hogmen consider all skin diseases of swine as the same and frequently class all as eczema. Prompt recognition of the particular type of infection is necessary before any treatment can be recommended.

Hogs may be infested with several varieties of internal parasites, the one causing the greatest losses being the common round-worm. Most farmers are familiar with this worm, but it is surprising that so little is done in the way of sensible control. Simple methods for the prevention of round-worms have long been advocated, but they require considerable extra work and many farmers resort to continuous worming as an easy way of relief. Such practices

are seldom successful and the grower of swine who has had severe losses from round-worm disease is urged to adopt the sanitation program recommended for its control.

An occasional herd may suffer from lung-worms, kidney-worms, or thorn-headed worms, but they do not cause as much trouble as the common round-worm. The suggestions given for the control of round-worms are easily understood and can be carried out by anyone who will pay close attention to the necessary details. Short cuts spell ruin to any plan of sanitation.

MANGE

Mange or scabies is a contagious skin disease of hogs. There are two types, sarcoptic or common mange, and demodectic or red mange. Both are caused by mites which live in the skin of the affected animals. Even though few animals die, considerable loss is experienced by the unthriftiness of the infected hogs.

Sarcoptic mange is by far the most common form of scabies. Once established in a herd it spreads rapidly and may cause severe losses if steps are not taken to bring the disease under control.

Cause

Sarcoptic mange is caused by a tiny eight-legged mite which is too small to be seen with the naked eye. This mite spends its entire life on the body of the infested animal. The adult digs or burrows into the deeper layers of the skin and excavates tunnels or galleries. Here the female mites lay their eggs. One female may lay as many as twenty-five eggs and dies soon after this is accomplished. The eggs hatch in about a week and, after passing through several molting stages, the young mites become grown up in two weeks. The females of this new generation now begin to lay eggs and soon another life cycle is completed. Thus, a new crop of mites comes into existence every two or three weeks. As the mites dig their way into the skin and move about

underneath, they cause a constant irritation which results in an intense itching sensation.

Symptoms

The activities of these burrowing mites produce an inflammation of the skin in any part of the body, although the first evidence is usually seen about the head. From here the disease may spread all over the body of the hog. The skin becomes reddened and, if examined closely, small red pin-point swellings may be observed. These frequently fester, come to a head, break, and discharge a pus-like liquid which soon dries, forming a crust or scab. When these tiny pimples are numerous and close together, a good-sized scab may be found. Each one of these pimples or pustules indicates that mites are located at

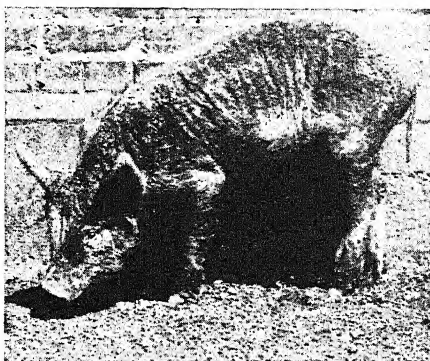


FIG. 28.—This animal is suffering from mange. The skin is wrinkled, cracked and scabby.

that point and are working under the skin. The skin is roughened, and when itching begins, the animal rubs and scratches incessantly until the hair is worn off in places, exposing the raw sores or cracked skin (Fig. 28).

If the rubbing and scratching is long continued, the skin becomes thickened, wrinkled, and leather-like in appearance. The skin of badly infested hogs often develops into a mass of raw oozing sores which crack and bleed. The appetite of the animal is diminished, weight is lost rapidly, and many of the sickest pigs will die if treatment is too long delayed.

The symptoms will aid in the recognition of mange, but a positive diagnosis can be made only in a laboratory. The mites are much too small to be identified with the unaided eye, but a fairly satisfactory diagnosis may be made with a magnifying glass or hand-lens. With the sharp edge of a knife, the skin should be scraped deeply to secure some of the scales close to the skin. It will be necessary to scrape hard enough to draw blood. The scrapings should be placed on a piece of black paper and finely pulverized, the paper held over the back of a stove until the scrapings become warm, and examined with a hand-lens. The heat will often cause the mites to become more active and they may be seen as tiny gray specks moving about on the black background. It will require very close scrutiny to locate the mites by this method. If a more certain means of diagnosis is desired, the skin scrapings should be placed in an envelope and sent to the entomology department of any state agricultural college. One should be sure to scrape deeply until blood is reached, because the mites live far down in the skin and may be missed if one fails to draw blood.

How the disease spreads

Mange, either common or red, may be transmitted by direct association with hogs already infected, or by contact with litter which has become contaminated with the mites. The common mange mite is sometimes found on man when the animals are carelessly handled, and precautions should be taken to avoid direct contact with scabby hogs.

Mange spreads rapidly when hogs are crowded during the winter months. The disease may occur at any time of the year, but the opportunities for infection of a large number of animals are much greater in winter than in summer. In summer the herd is usually on pasture, where close contacts are not so frequent. Mites may live for five or six weeks in the litter of an infected pen or yard.

Treatment

If the owner does not wait too long, the treatment of sarcoptic mange is usually successful, with hand applications, spraying, oilers, medicated wallows, and dipping. During the winter months when dipping is not advisable, hand treatments may be tried with a fair prospect of success. Dipping is the best treatment, but it should not be used in cold weather. Regardless of the method, it is always best to treat all animals in the herd even though only a few appear to be infected.

The application of crude petroleum, equal parts of cottonseed-oil and petroleum, or the kerosene and lard mixture may be tried. Any one of these is good. The kerosene and lard mixture is made by mixing $\frac{1}{2}$ pint of kerosene with 1 pound of lard. Crude petroleum is considered the best of the three, because it spreads easily and sticks to the skin. Either of the oil treatments may be applied with a sprinkling can or by hand with a stiff brush. The kerosene and lard should be applied with a rag or brush. The animals should be kept in the shade for some hours after the treatment. The hand applications must be repeated every week or ten days until good results are noted.

Crude petroleum or the half and half cottonseed and crude petroleum mixture may be used as sprays. The spray treatment, however, is wasteful and it is sometimes difficult to prevent the nozzle of the sprayer from becoming clogged with the heavy oils. This method is also for summer or warm weather. After treatment, the animals should be kept out of the sun and in a large inclosure where they are not likely to be crowded. Applications should be repeated every week or ten days until cured.

Rubbing posts or oilers are used frequently to control lice and mange. They are never as effective as any of the other methods, especially when the herd is badly infected, because the animal does not always succeed in covering the parts where the oil is most needed. When oilers are in constant

use, they have a tendency to keep animals free from infection and also prevent the disease from spreading rapidly through the herd.

There are several kinds of patented hog oilers for sale, any of which will serve the purpose. A home-made oiled rubbing post is easily made by wrapping several layers of gunny-sacks about a post firmly set in the ground. The sacks are tied securely about the post and kept saturated with crude petroleum. If an outbreak of mange is in progress in a herd, hand applications, spraying, or dipping would be a much more satisfactory form of treatment.

Taking advantage of the fact that hogs enjoy wallowing in a pool of water, crude petroleum may be added to the wallow and the animals allowed to treat themselves. This might be effective in mild cases of the disease. It is difficult to make use of a mud hole for this style of treatment. It is best to construct a regular concrete wallow. It should be built in the shade and deep enough to permit an animal to cover all of its body when lying down. Care should be taken that the pool is not too deep, for the animal will avoid it if unable to keep its nose above the surface of the water. The pool should be filled with water, leaving enough space so that 4 or 5 inches of crude petroleum may be added without overflowing the tank when the hog lies down. As each hog bathes, it will be covered with a thin coating of the oil. The wallow should not be kept continuously covered with oil. If the oil is added late in the afternoon, most of the animals will have bathed by noon the next day. At that time the pool should be drained and refilled with clean fresh water. The treatment may be repeated every ten days until the animals show a marked improvement.

Treatment by dipping

Dipping constitutes the best and most effective method of treatment, but must be used in warm weather only. It is the easiest way to treat a large number of hogs. The usual method is to construct a vat or tank through which the

animals swim (Fig. 29). The objection to this treatment is the expense involved in the construction of the vat. If the number to be treated is small, almost any kind of tank may be used to immerse the animals. Various types of

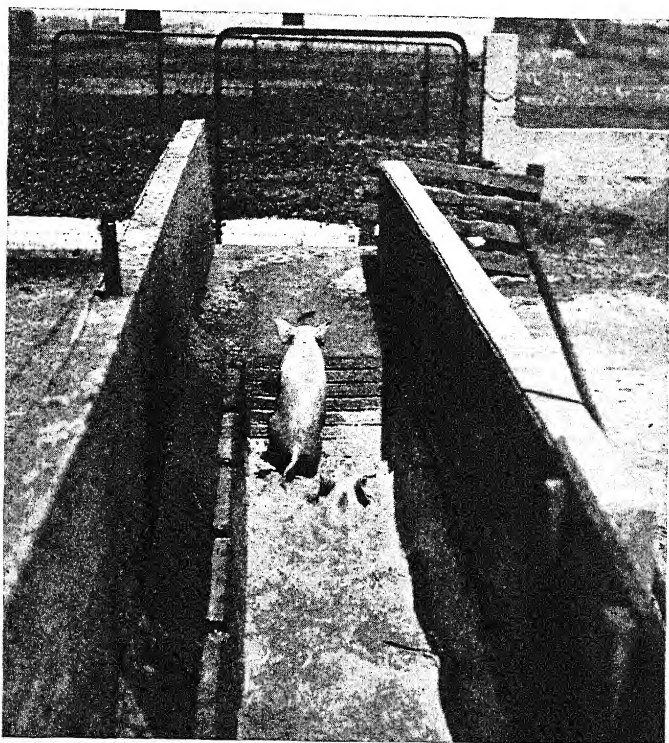


Fig. 29.—Pigs passing through a dip bath in the treatment of mange. They are forced to swim through the dip liquid.

metal watering tanks have given good results. These may be sunk in the ground and arranged so that the hogs enter one end of the tank, swim through, and pass out the other end.

Before the treatment is undertaken, the animals should be watered and allowed to remain in the shade to avoid overheating. After the treatment, the pigs should be herded in a shady inclosure. Pregnant hogs at or very near farrowing time should never be dipped.

Several good solutions are recommended for dipping, but the best and cheapest is crude petroleum, either processed or unprocessed. The thinner it is, the better. After the vat or tank is arranged, it should be filled with water to within 18 inches of the top; add to this enough crude petroleum to form a layer of oil about 6 inches deep. This treatment is essentially the same as the medicated wallow, but does not leave anything to chance. The animals are forcibly put through the tank and there is no chance of a few escaping. One treatment is usually sufficient in mild infections.

Another popular dipping liquid is the lime-sulfur dip. This solution may be home-made, but it is usually cheaper and more satisfactory to buy it already prepared and ready for use. A druggist probably will not have it in stock, but he can order from any wholesale drug house. The directions for use will be found on the container. The lime-sulfur treatment usually requires at least four applications about a week apart. This, of course, is a decided disadvantage.

The coal-tar dips with which all farmers are familiar are not recommended for the treatment of mange.

Arsenical dip solutions may be used, but the crude petroleum is far more effective. The arsenical dip requires several dippings about a week apart. The arsenic mixture prepared especially for this purpose may be secured from any up-to-date drug-store and the directions on the label of the container followed.

Demodectic or red mange

This is an uncommon form of mange, and is considered incurable. Red mange is contagious. It is caused by a

mite which burrows into the skin and locates in the hair-follicles or roots and sweat-glands. Here the mites live and multiply.

This type of mange usually appears first about the head or snout, spreading from here to other parts of the body, favoring those regions where the skin is thinnest, as about the sides and belly. The back and upper sides are seldom affected.

The early signs of red mange are skin eruptions or pinpoint swellings which may take on the appearance of a pimple. Later these break and discharge pus. When numerous, these pustules run together and appear as one continuous crust or scab. The skin is often wrinkled, bald, and bleeding. The itching is intense and the affected animal will be observed to scratch and rub incessantly. The symptoms alone will not enable this form of mange to be distinguished from the common variety.

A positive diagnosis is only possible with a microscope, but a guess may be made by examining the scrapings with a good magnifying glass. The skin must be scraped deeply until the blood starts to flow. The scrapings should then be pulverized and spread out in a thin layer on black paper or cloth and examined carefully with the magnifying glass, to discover tiny moving gray specks. Such an examination will not distinguish the particular kind of mange mite, but it is often helpful when the better method of recognition is not available.

There is no successful treatment for this form of mange. The badly affected animals should be killed. The only suggested treatment is the use of crude petroleum and this will apply in mild cases only. If the animals fail to respond to the treatment after two or three applications, they should be destroyed.

Cleaning up after an outbreak of mange

The owner of an infected herd should remember that while sarcoptic or common mange is the one usually encoun-

tered, the clean-up program would be the same for either type. Both are contagious diseases and steps should be taken to remove all traces of the mites from the premises.

It is always good practice to haul out and burn all litter from the houses and yards where the animals were kept. The floor of the hog houses should be thoroughly cleaned and scrubbed with hot water and then sprayed with a good disinfectant solution. Even though mites seldom live more than a month away from the body of hogs, it is an added measure of safety to make an attempt to rid the yards and houses of these pests. The eggs or nits of the mites also live as long as a month when not exposed to direct sunshine. The owner should be careful to protect himself from infection while handling infected hogs and during the process of cleaning up.

LICE

Pigs heavily infested with lice often become unthrifty and many develop into runts. Lice spend most of their waking hours biting the skin of the hog, and the continual irritation interferes with the feeding habits of the animal to such an extent that it does not consume sufficient food for normal growth.

The common hog louse is a blood-sucker, securing its food by puncturing the skin and sucking blood. The hog louse is the largest of all those infesting live-stock and may sometimes be $\frac{1}{4}$ inch in length. Lice spend their entire life on the body of the animal. The adult female louse lays her eggs or nits and sticks them to the hair close to the skin of the hog. She may lay about six eggs a day for a month and when the laying period is completed, dies. The eggs hatch in about two weeks and develop into full-grown mites in another ten days to two weeks. When separated from a hog, lice live only a few days.

Lice are large enough to be seen with the naked eye. They are on the move all the time and are always in search of food. They bite the skin in preparation for blood-sucking

and this causes the hog to rub and scratch itself against any nearby object. The skin in some parts of the body becomes bare. When badly infested the animals fail to grow normally and the resulting lack of condition may render them more susceptible to other diseases. The finding of lice should make the diagnosis easy.

Treatment

Lice may be eradicated by the same methods as outlined for the treatment of mange, namely by hand applications, spraying, oilers, medicated wallows, and dipping. A small herd may easily be rid of lice by hand applications of crude petroleum. It should be kept in mind that the oil treatment does not destroy the nits or eggs attached to the hairs. On this account the animals must be treated again as soon as the nits hatch, which will be in about two weeks after the first treatment.

The crude oil may be brushed or sprayed on the animals. Oilers may be used to keep down further infestation. With large numbers dipping is the best form of treatment. It cannot be used in cold weather. For winter treatment hand applications are always advisable.

Lice live several days off the body of hogs. It is, therefore, necessary to remove and burn all litter in places where the animals have been housed. Spray the woodwork and floors with any good disinfectant solution twice about ten to fourteen days apart.

THE COMMON ROUND-WORM OF HOGS

To most growers of swine the problem of round-worm control has always been serious. On some farms the disease has become so firmly established that severe losses seem to be unavoidable. Worms have been combatted for many years with worm expellers of various kinds without gaining any headway. Probably even comparative freedom from this parasite will never be attained by the use of drugs.

Owing to the unsanitary conditions prevailing about the

quarters of hogs, the existence of the worms is encouraged and eradication becomes more difficult. Drugs, worm powders, and many of the so-called conditioners will not solve the problem. Heavy losses from round-worm disease are largely preventable if proper precautions are taken in the care of the small pigs. Many pig-crop failures can be traced directly to this worm. This parasite not only causes the death of thousands of pigs annually, but is responsible for great numbers of runts. It is estimated that 10 per cent of all pigs farrowed each year become runts. The common round-worm does its full share in piling up this number.

It is of little benefit to treat the older pigs with worm expellers, if by so doing one gets a false sense of security and neglects the young ones. A great many cases of "thumps" are due to worms. Pneumonia, indigestion, unthriftiness, and scours can often be laid to this cause. The usual practice of worming pigs may give temporary relief, but the losses will never be reduced appreciably until the worm problem is thoroughly understood.

The cause of worms

Anyone who raises hogs should be familiar with these worms. There are some owners of swine who still think that worms rain down or spring up by spontaneous generation from nothing at all; some think worms come from feeding pigs tankage; others believe they are caused by feeding skimmed-milk. Pigs become infected and worms develop in the intestines because they have eaten worm eggs in dirty infected hog lots. The common round-worm is white with pointed ends and sometimes attains a length of 6 to 10 inches (Fig. 30). Round-worms are both male and female. The female worm may produce as many as 80,000,000 eggs. These eggs infect the soil and are responsible for the disease in other pigs.

Mature hogs in good condition may carry a considerable number of full-grown round-worms in their intestines, but they are old enough to withstand the attacks of the worms

and health is not endangered by their presence. It is entirely different with young pigs, because they are very easily infected with worm eggs and the worms develop in them rapidly, especially in those animals under four months of age. As the pigs grow older, they become more immune to worm infection. If small pigs could be kept away from infection until they reached four months of age, it is very

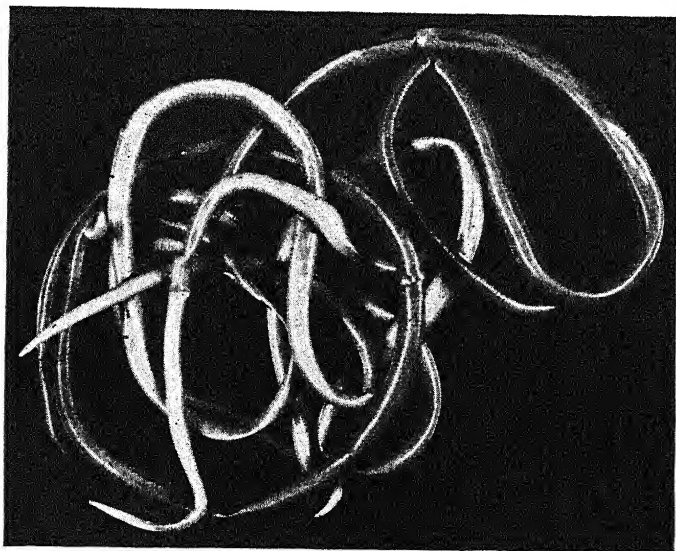


FIG. 30.—Common round-worms of swine.

doubtful whether they would be seriously inconvenienced by a few worms.

If the reader has had trouble with round-worms in pigs, he should study the life history of these worms and learn their habits (Fig. 31). To make this easily understood, one may begin with a herd of adult hogs which is being wormed in the late summer or fall. The herd may be wormed with capsules or any other method. If the treatment is success-

The Roundworm's Journey Through The Pig.

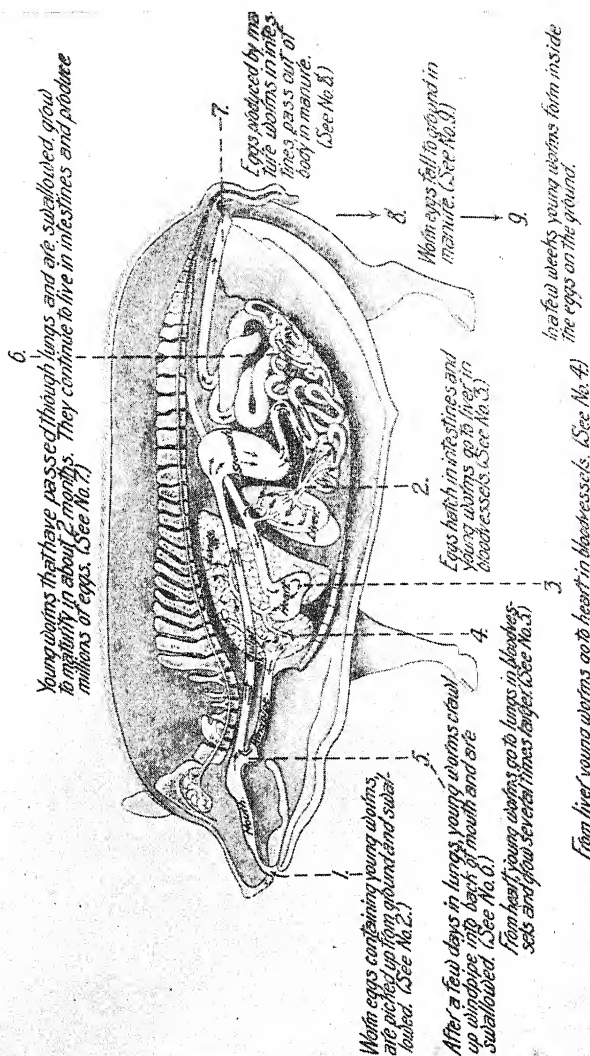


Fig. 31.—Route of the round-worm through the body of a pig.

ful, large numbers of the full-grown worms will be passed in the hog lot and on the floor of the hog house. These worms, together with the manure from the hogs, contain literally billions of eggs. The bodies of the worms are soon crushed in the soil and millions of eggs are liberated from each female. These eventually become mixed with the soil of the lot. When the eggs are first passed from the hog, they are not dangerous because they have not gone through a period of incubation. It is well to remember that all eggs must be incubated before they can reproduce again. After a few weeks of warm weather and moisture, the eggs incubate in the mud and develop into another stage in which there is a tiny worm inside the capsule or covering of the egg. The eggs are now able to infect another pig when taken into the intestines by way of the mouth. At this stage the eggs may live long periods and even survive a very severe winter. Most chemical disinfectants have little or no effect on them, so that the usual practice of disinfecting a hog lot to prevent worms is worthless. There are records of the eggs remaining alive for several years. Scalding water will kill them quickly, but this would not be practical as a means of hog-lot disinfection.

In the early winter months the ground about the hog houses freezes and the herd goes into winter quarters. In the spring when the little pigs are farrowed they are often allowed to go out into the old lot on the first pleasant day. If the weather is warm the lot is likely to be very muddy and pools of water contain thousands of partially developed worm eggs waiting to be taken in by the young pigs. In rooting and drinking the little pigs swallow innumerable eggs which are carried on down into the intestines. Here the shell is dissolved from the eggs and the worms are liberated. The small worms do not stay here long, but leave the intestine, burrow into the intestinal wall, and enter a blood-vessel. From here they pass through the liver and eventually reach the lungs. The worms develop still further in the lungs and after several days crawl up the windpipe and

are coughed up into the mouth. Since pigs do not expectorate, the young growing worms are re-swallowed and carried back into the intestines where they complete their growth. It requires about ten days to two weeks for the worms to make the round trip to the lungs and back into the intestines, developing into a full-grown worm in about two and one-half months.

If a small pig received only one exposure to the worm eggs in the infected hog lot, it is probable that no serious results would follow. It is only after continual reinfection dozens of times each day that the animal begins to show the effects of the incessant irritation caused by the worms' passage through the lungs. This unending procession of immature round-worms through the lungs sets up an inflammation which results in coughing and possibly pneumonia.

Symptoms of worms in young pigs

If the little pig is permitted to have the run of an infected hog lot, it will not be long before the preliminary signs are observed. The pig may be almost any age up to four months. Older pigs may be infected, but these cases are relatively rare, at least they do not cause serious losses. The small pig is the one to be watched.

At first the affected pig may show evidence of falling a little behind his brothers and sisters in the same litter. Several pigs in the litter may be seriously affected at the same time and appear to go backward rather than grow normally. The worms, as they pass from the intestines into the blood-vessels and thence into the lungs, may carry germs on their bodies which often lead to an infection of the lungs. The little fellow breathes irregularly and the owner usually thinks the animal is suffering from "thumps." Thumps has long been considered to be the result of over-feeding or too close confinement. It is probable that nine out of ten cases of so-called thumps in small pigs are in reality nothing more than the lung stage of the common intestinal round-worm. Along with a cough, the eyes frequently

become bleary and bloodshot. A discharge or sticky substance often causes the lids to become glued shut. After a time the pig becomes pot-bellied and moves with arched back. The tail which is usually carried in a jaunty manner is limp and minus its curl. Some pigs actually appear to shrivel and dry up (Fig. 32). The animal moves with uneven and unsteady gait and, as the common expression goes, the feet do not track. Whenever pigs are raised on lots where worm infection is known to exist and some from

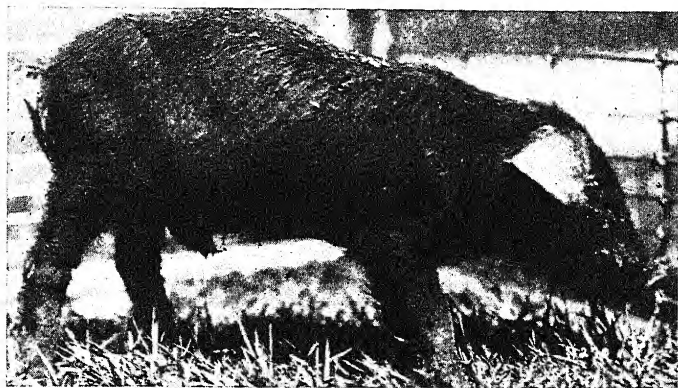


FIG. 32.—A typical worm-infested pig. No treatment will cure this runt.

one month to four months of age begin to show evidence of coughing, loss of condition, uneven gait, and general unthriftiness, round-worm infection may be suspected.

How to find the worms

Some of the army of traveling "experts" who travel about the country taking advantage of the general prevalence of this disease to sell some cure-all, often assume powers which a well-qualified veterinarian would hesitate to claim. Many think they are able to diagnose worms in small pigs by simply looking at the sick pigs. This, of course, is folly.

In order to make a satisfactory diagnosis, it is always necessary to examine a dead pig. Open one that has recently died or kill one that appears about ready to die.

It takes about two and one-half months for the round-worm to reach maturity and it is possible that a pig in the early stages might not show worms in the intestines. This might confuse the examiner and lead him to believe that worms were not the cause of the trouble. When worms are not seen in the intestines, the lungs should be examined. The intestines may be opened with a pair of scissors. If the pig is three or four months old and well advanced in the disease, the worms have had time to reach the intestines on the return trip and to become large enough to be seen easily. Open the intestines from end to end. The worms are white, have pointed ends, and appear to be starched, because they move very stiffly. As many as a hatful of these worms have been taken from the intestines of one pig. One or two worms probably do little harm, but when several dozen are present there is no doubt as to the damage. After slitting the intestines, open the gall-bladder and slice the liver in sections. In cases of heavy infestation with worms, many of them work their way into the liver and bile-ducts. .

Should there be no evidence of the full-grown worms in the intestines or liver, open the chest cavity and examine the lungs. If the pig has a large number of worms in progress through the lungs there may be a pneumonia. The lungs often appear solid and of variegated color. The lower portions may feel like liver and a piece of it will sink to the bottom of a pail of water. This is a sure indication of pneumonia. If the lung is not affected badly enough to show the pneumonia, look for red pin-point hemorrhages on the surface of the lungs. Each one of these spots represents a place where a worm is in the process of growing. A few days later it will be coughed up into the mouth and re-swallowed. After the worm reaches the intestines it stays there and continues to develop into an adult.

Treatment of wormy pigs

It is difficult to combat worms with drugs or chemicals. It is impossible to dislodge the worms when they are in the lungs. The entire problem is one of prevention, but often an owner desires to attempt some treatment for their removal. It should be kept in mind that the greatest damage has already been done and plans should be made to prevent a re-occurrence of the disease the next season.

Mineral mixtures or tonics containing drugs and chemicals are not recommended to expel or prevent worms. The continuous feeding of various drugs in the drinking water or feed is not effective. Worms are so common on many farms that innumerable sure cures are offered and the owner of wormy pigs is usually very susceptible to this type of treatment, because it is easy and does not require any radical change in his method of management. The best that can be said for these is that they do not harm the animals.

The simplest and best form of treatment is to give each hog a dose of a reliable worm expeller. Nothing is left to chance. Each animal receives the proper amount of the drug or chemical and the results are much more satisfactory. When drugs are placed in the feed or slop, the weak and unthrifty pigs are not likely to get their full share of the feed and, as a result, they receive little if any benefit. The individual treatment is by far the best but takes time, and the owner who is hard-pressed by other farm activities often adopts the easy and useless method.

It is always considered good practice to consult a veterinarian in regard to treatment. His advice is far better than that of the itinerant peddler. The individual treatments which follow are given for those who desire to treat their own animals. It should be stated that it is not easy to dose or pill hogs. Many animals are killed by careless handling, and the dose of medicine may go down the windpipe instead of the oesophagus or gullet.

Santonin has for many years been the standard drug for the expulsion of round-worms. It is, however, very expen-

sive and for this reason has been largely supplanted by other and cheaper drugs, many of which are fully as effective. The usual dose of santonin is 5 grains for a 50-pound pig. The santonin is put up in 5-grain capsules mixed with 2 grains of calomel. These could be made up by the local druggist.

Oil of chenopodium is commonly used and is administered in doses of 2 cubic centimeters for each 50 pounds of live weight. It may be given in a capsule form or mixed with an ounce of castor oil. When the oil of chenopodium is given in capsule form, it should be followed by 1-ounce doses of Epsom salts about three hours afterward. If a large number of animals is to be treated, Graham suggests that $\frac{1}{2}$ pound of oil of chenopodium be mixed with 1 gallon of castor oil. Each animal is given 1 ounce of this mixture for each 50-pound pig. If the worm treatment is used in liquid form, it will be best to purchase a regular metal dose syringe designed for this purpose (Fig. 33). These may be purchased from a druggist or any stockman's supply house.

Many commercial concerns offer worm capsules containing either santonin or oil of chenopodium. Care should be taken that capsules do not become lodged in the pouch in the back of the mouth. If this happens, the animal is almost sure to die. Capsules are best given with the cus-

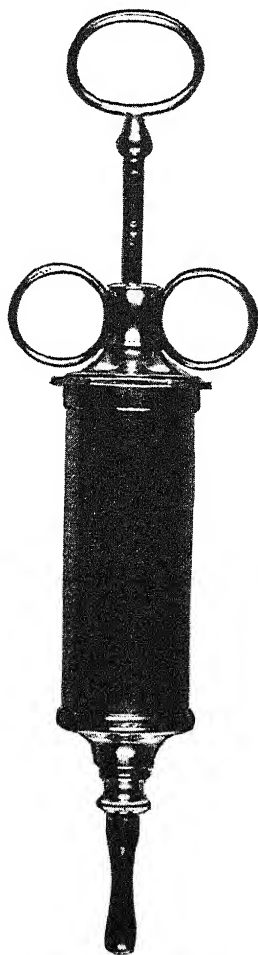


FIG. 33.—All-metal syringe for dosing pigs or sheep with any medicine.

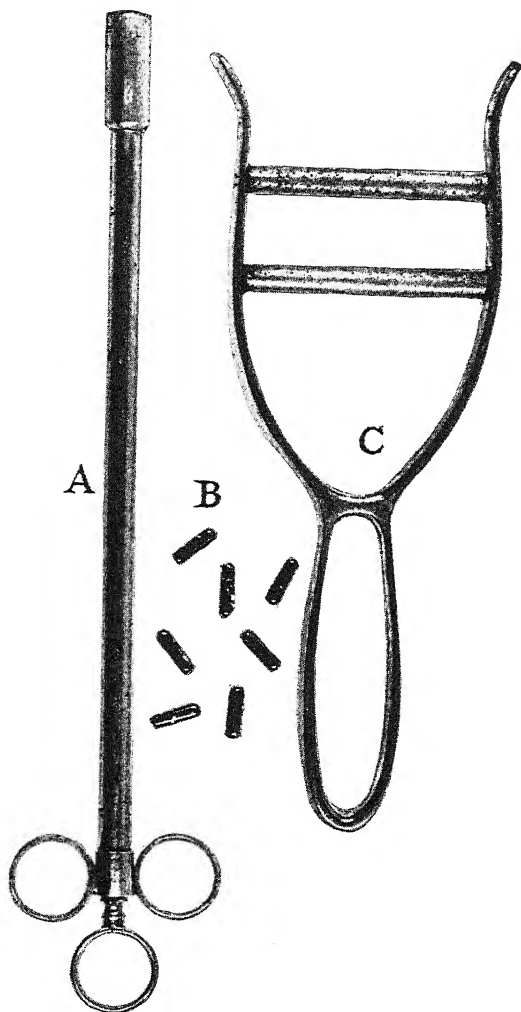


FIG. 34.—Outfit for treating wormy pigs.
A, pilling gun; B, worm capsules; C, speculum
or mouth gag.

tomary pilling gun, which is easily secured. This is a metal tube with a plunger which deposits the pill in the back of the pig's mouth (Fig. 34). Do not force the pill too far back, but rather try to place the pill over the back of the tongue and allow the animal to swallow naturally. The animal should not be cramped in such a position that it is unable to swallow without gagging. A speculum or mouth gag may be purchased to aid in giving the capsules. This is a metal instrument which is placed in the mouth to hold the jaws open while the pill is put in the back. A little practice will enable the owner to become fairly adept in the art of pilling. The only danger is encountered when the pill lodges in the pouch in the back of the mouth. If the pill breaks there, the contents may injure the lining of the mouth and often drain into the lungs, when death usually follows from pneumonia.

Turpentine is often given in milk at the rate of a teaspoonful to a 100-pound hog. This treatment, however, is not nearly as effective as the santonin or oil of chenopodium and must be repeated every three or four weeks.

Regardless of the treatment, it is always best to fast the animals twenty-four to thirty-six hours before the dose is administered. If the drug is not given in a laxative, such as castor oil, it should be followed by a physic three or four hours afterwards. This will expel the worms that have been killed or drugged by the medicine.

The treatment for worms, as stated above, is specific and drugs given in mineral feed, slop or feed are not advised. The individual treatment with capsules or liquid doses is always best when given by some one who understands how to administer the dose. If the owner is not skilled in such practices, he should secure the services of a veterinarian or at least some person who has had experience in dosing pigs.

How to prevent worms

Treatment may at times be necessary, but the proper procedure is to adopt a plan of sanitation which will pre-

vent the little pigs from becoming infected. Such a plan has been formulated and is called the McLean County System of Swine Sanitation. It is merely a common-sense method of dodging worms. There is nothing in the plan that any farmer, owner or renter, cannot do. The plan consists of four simple steps and the reasons for each are plain if one understands the life history of the round-worm.

1. The sow must be provided with a clean place in which to farrow. The farrowing quarters should be scrubbed with boiling water. Add about 1 pound of lye to 30 or 40 gallons of boiling water. The lye will loosen the dirt and grease and the hot water will kill any worm eggs that may be on the floor. The scalding water is the quickest and best way to destroy the eggs and has the added advantage of being cheap. Heat the water in a large kettle near the pen, because if heated in the farmhouse it will have had time to cool before it is applied to the floor. The water must be scalding to be effective. Scrape out all dirt and litter with a hoe before the hot water is applied.

2. Give the sow a bath. This seems to amuse most hogmen, but it is an excellent practice. The sow may make some fuss the first time she is bathed, but soon looks forward to this sign of the owner's regard. Use warm water and soap. Scrub off the belly, udder and sides. The reason for this is to remove all worm eggs that may be adhering to the teats and thus prevent the little pigs from being infected with their first meal. This step is important and should not be omitted.

3. When the little pigs are farrowed, they should not be permitted to go out into the dirty yards adjoining the farrowing house. This is almost sure to cause infection. There is some objection to keeping the pigs inside for long, because it is feared that they will develop "thumps" from lack of exercise and too much milk. This is largely superstition. Most of the pigs with thumps are infected with worms in the lung stage. As soon as the weather is favorable, the sow and her litter should be placed in a suitable carrier and

transported to a clean field at some distance from the farmstead (Fig. 35). This field should be a pasture (alfalfa is excellent) where pigs have not been the year before. If the sows are bred to farrow reasonably late in the spring, it is often possible to permit the animal to farrow on pasture in the common "A" type house now so widely used. The average farmer would be far better off if his sows farrowed in May rather than March or early April, for many do not have proper equipment for early farrowing.

4. Keep the sow and her litter on the clean pasture until the pigs are four months old. After this they are not likely

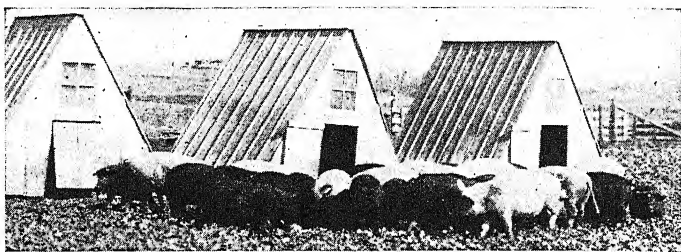


FIG. 35.—A-shaped portable hog house on clean alfalfa pasture. Necro or worms did not affect these pigs.

to be injured, even though exposed to worms. This plan will also prevent necro and scours, which is usually caused by insanitary surroundings. This method may not be easy, but it works. It will enable the owner to raise better pigs with fewer runts. He will produce more pork with less feed. The animals will make faster gains and reach an earlier market. There is no royal road to success in swine-raising. It entails hard work, but with a knowledge of the facts the farmer who still resorts to pills and potions is behind the times.

LUNG-WORMS

Lung-worm infection in swine should not be confused with the disease set up by the lung stage of the common round intestinal worm. Both are distinct diseases and are

caused by two very different worms whose habits are in no way alike. While lung-worms in swine are not as prevalent as in sheep, they may at times cause severe losses. It is possible that this parasite is more widely distributed than generally supposed and, the infestation being of such a mild character, nothing more than occasional coughing may be noticed. There are, no doubt, many cases in which a general unthriftiness in a herd may be due to this disease which passes unrecognized. The lungs may contain worms in numbers sufficient to interfere with the normal growth of the animals, but are not present in large enough quantities to cause deaths.

Life history of the worm

The adult lung-worm is white or brownish-white in color and ranges from 1 to 3 inches in length. These worms are fine and appear somewhat like short pieces of white linen thread. Unless they are suspected to be the cause of the disease under investigation, they may be easily overlooked. This is especially true when the lung is not sliced in sections and carefully examined. Even then the worms may not be seen if only a few are present.

The complete life history of lung-worms is not well understood. It is known that the adult females lay their eggs in the air passages or bronchi. Here the eggs develop into larvæ or immature worms and are then coughed up into the mouth, re-swallowed, and, after passing through the intestines, emerge with the manure or feces. Having reached the outside world, the larvæ are supposed to pass through several stages, perhaps in the body of an earthworm or other insect. The direct infection from pig to pig is very unlikely, because it has been demonstrated that a healthy pig cannot be infected by injecting the undeveloped live eggs or larvæ into its windpipes or air passages. Another unknown intermediate stage intervenes between the time the eggs leave the infected pig by way of the manure and the time the young worms re-enter the body of another animal. The

exact manner in which the newly hatched young worms find their way back from the ground into another animal has not been discovered. Perhaps when this is known, control measures will be more effective.

Symptoms of lung-worm disease

The chief symptom is coughing. The amount and severity will depend on the number of worms in the lungs and also whether pneumonia has begun. As noted before, there may be mild cases of this disease which pass unrecognized and without losses other than some unthriftiness of the affected pigs. If the coughing appears during dry and dusty weather, it is likely that the dust will be blamed. Badly infested hogs might show a frequent and persistent cough together with a discharge from the nostrils. Difficult breathing may be observed. A post-mortem examination of a carcass would be necessary to identify this disease positively.

A careful examination of the carcass should be made to eliminate such other diseases as cholera, necro, or intestinal worms. If no evidence of these diseases is present, the lungs should be opened with scissors and a sharp knife. Cut into the bronchi or air passages and look carefully for thread-like white worms. They are frequently buried in a mass of blood-stained sticky mucous or phlegm. If the worms are numerous they may appear as a tangled mass of white thread protruding from the cut end of an air passage. In long-standing cases the lungs may show signs of pneumonia as evidenced by discolored areas which appear liver-like when cut into with a knife. There may be small nodules or lumps about the size of a millet seed on or near the surface of the lung. When sliced, these may have a hard yellow center. These nodules are in reality dried-up abscesses surrounding a center where a mass of lung-worm eggs or larvæ has accumulated. The finding of the worms and the elimination of the possibility of other complicating diseases would establish a reasonably safe diagnosis.

Treatment

There is no successful treatment for lung-worm disease in swine. The injection of various liquids into the windpipe has been tried, but this is usually more dangerous than the disease itself. Fumigation and inhalation of certain gases have been attempted with little or no success.

No satisfactory method of control can be outlined until the complete life history of the worm is known. The general recommendation is to avoid low wet lots or pastures, because moisture always favors the growth and development of the eggs or larvæ of all parasites.

THORN-HEADED WORMS

The thorn-headed or giant intestinal worm of swine is uncommon in the northern states, but is frequent in the South. Its effects are much the same as the common round-worm, except that the thorn-headed worm does not pass through the lungs in its development.

Life history of the worm

The thorn-headed worm is round, white, and varies in length from 3 to 12 inches. It resembles the common round-worm but differs in the head being equipped with five or six rows of hooks which enable it to hang on to the inside of the intestine. The worm is wrinkled crosswise and tapers to a point at the tail. The full-grown worm is found only in the small intestine. The fact that the worm is attached to the wall of the intestine and has crosswise wrinkles will serve to distinguish it from other intestinal worms.

This worm lives in its adult form in the intestines and produces eggs which pass to the ground in the manure of the infected pig. Here the eggs are taken by the larvæ or white grubs of the May-beetle and hatch out in its digestive tract. The young worm now burrows through the grub's intestine and becomes established in the body cavity. In this form it may continue to live as the grub passes through several

molting stages. If the grub is eaten by a hog during this time, it passes into the intestines where the grub is dissolved or digested and the young thorn-headed worm is released. It soon hooks on to the wall of the intestine and grows to maturity. This causes an area of inflammation or reddening and, when the worms are numerous, a considerable portion of the intestines may be involved. Germs frequently enter through the skin puncture, causing the formation of small nodules or swellings which often extend through to the outer surface of the intestine. When these nodules rupture their contents into the abdominal cavity, a fatal peritonitis follows.

The presence of large numbers of the worms would interfere with the general health of the animal and might even cause a stoppage of the bowel. The continued irritation of numbers of these worms is sufficient to cause the animal much distress.

Symptoms

The affected pigs might show the same symptoms of a heavy infestation of common round-worms. Pain or colic is evidenced by uneasiness and continued grunting. The appetite is reduced and this is followed by general weakness and unthriftiness. Muscular spasms or epileptic fits have been described. It would be very difficult to distinguish the disease by the symptoms alone, a post-mortem examination being necessary to establish the identity of the worm. The finding of these white worms firmly attached to the inside lining of the bowel should enable one to recognize this disease.

Treatment

There is no satisfactory treatment for this worm, because they fasten themselves to the intestinal wall and are, therefore, difficult to loosen. The same methods outlined for the expulsion of the common round-worm are suggested. The

animals should be starved for twenty-four hours before the treatment is administered.

Pasture rotation should be helpful in controlling this disease. Old yards considered to be infected should be plowed.

KIDNEY-WORMS

The kidney-worm is not a common parasite of northern swine, but is often observed in hogs raised in the southern states. This disease was first discovered in Brazil. It is not responsible for severe losses in the United States.

Kidney-worms are round and present a red, white, or black mottled appearance. They range from 1 to 1½ inches in length. The body of the worm is semi-transparent. The name would suggest that these worms are found in the kidneys, but this is not the case. They live in the fatty tissue surrounding the kidney and are observed only when the fat is cut into, exposing the cysts or cavities which surround the worm. Some of these cysts may be as large as the end of one's thumb and often contain pus. On rare occasions the worms may invade the liver.

It is probable that infection takes place by way of the mouth through contaminated food and water. The young worms are swallowed and carried to the intestine, from which they work their way into the fat about the kidneys. The exact manner in which they become located there is unknown.

At present this disease is relatively uncommon. No treatment has ever been suggested because the location of the worm makes it impossible to reach them.

TRICHINOSIS

Trichinosis is not a common disease of hogs. It is interesting largely because man is sometimes infected. At one time American pork was discriminated against on account of this parasite, and the federal government maintained a rigid inspection of hog carcasses.

The importance of the disease in hogs is over-shadowed by the danger to human health, but modern systems of meat inspection and improved methods of curing and preserving pork products have greatly reduced this menace. Most cases of human infection are traced to the eating of home-made pork sausage and the consumption of pork that has been only partially cooked.

Life history of the worm

The worms causing trichinosis are very small, rarely exceeding $\frac{1}{8}$ inch in length, even when full grown. The adults are found chiefly in the intestines of hogs and rats. The females burrow into the walls of the intestines and deposit young living worms. A single adult female may produce as many as 2,000 little worms. These soon begin to wander from their nests in the wall of the intestines and eventually wriggle their way into a blood-vessel and are carried to various parts of the body. Many die during this journey, but the survivors find lodgment in the muscle fibers in the fleshy parts of the body. In about three weeks the worms are matured, but are still too small to be seen with the naked eye. When such infected parts of muscle are examined under a microscope, the worms appear coiled or twisted in the fibers. This period in the life of the worm is called muscular trichinosis. During this stage the worms may remain alive and active for several years. Such pork would be dangerous for human consumption.

Later, when the hog is slaughtered, portions of the offal or trimmings containing the worms may be eaten by other hogs. The encysted or encapsulated young worms are swallowed, the muscular tissue about them is digested or dissolved, and the young liberated worms proceed to grow to maturity in the intestine. It should be kept in mind that the adult form of this worm is not harmful, but rather the stage during which the young worms are imbedded in the muscle.

How man becomes infected

Sometimes hogs infected with trichinæ pass through the slaughter-house and portions of the affected meat are eaten without thorough cooking. While curing and salting may reduce the possibility of infection, proper cooking of pork is the most reliable way to kill the tiny worms imbedded in the meat.

When uncooked infected pork is eaten by man, the worms are carried into the intestines where they develop and grow to maturity. The females lay their eggs in the intestinal wall, the same as in hogs, and the young worms migrate into the muscles. This sets up a very painful and often fatal disease.

While the introduction of more careful meat inspection, together with new and improved methods of curing, has reduced the occurrence of the disease in man, thorough cooking of all pork products is always advised. The percentage of hogs affected with trichinosis is very small and only an occasional case of the disease in man is reported.

Symptoms of trichinosis in hogs

The symptoms of this disease are variable and of little value in identifying the infection. Recognition of the disease in live sick animals is never attempted. The diagnosis is always made by a microscopic examination of the affected muscle.

Treatment and prevention

There is no treatment for this disease in hogs. It may be prevented by the proper destruction of all hogs and rats that die on the farm. Other animals are not often affected. The prevention of the disease in man is accomplished by careful cooking of all pork products.

CHAPTER XVII

FARROWING TIME

THE care of the breeding herd and especially the brood sow is very important and if owners of swine were more fore-sighted in this respect it would be possible to avoid many unnecessary losses. The proper handling of the pregnant sow should be studied and a few simple practices put into effect. The first few days in the lives of small pigs are crucial and they should be watched over carefully at this time. When scours break out in a litter, there are a few sensible steps to follow in order to insure one against heavy losses. When several sows in the herd give birth to litters of hairless and goitered pigs, nothing can be done at the time, but this disaster could easily have been avoided. These, together with several other common problems, will be discussed in this chapter.

CARE OF THE SOW DURING PREGNANCY

The pregnant sow should be well fed while she is carrying her litter. Young sows need more generous feeding than older ones, because they are still growing and require the additional feed for their own development. A daily ration composed of 2 pounds of shelled corn, 2 pounds of oats, and 1 pound of alfalfa hay would be sufficient for a sow weighing about 200 pounds. The addition of skim-milk or buttermilk would make the ration more satisfactory for pregnant gilts. Other feed combinations may utilize home-grown feeds. It is essential that the sows be in good physical condition at farrowing time but not fat, because fat sows are usually lazy and frequently have a hard time farrowing their litters, which are often weak.

Exercise is also important as a conditioner. During moderate winter weather the sows may be allowed to exercise in a nearby field or feed may be placed at some distance from the sleeping quarters, so the animals will be forced to take a sufficient amount of healthful exercise as they walk to and from their meals.

If some of the sows have given birth to hairless pigs in previous years, a repetition of this disease may be prevented by feeding a mineral mixture containing $\frac{1}{3}$ ounce of potassium iodide for each 100 pounds of the mineral. Many commercial mineral mixtures contain iodine, but it is always well to make sure there is enough. Iodine may also be given to sows in the drinking water or slop. The amount of potassium iodide one can place on the tip of an ordinary pocket-knife-blade may be given each sow once a week during pregnancy. It is much less trouble to give the iodine as a part of the mineral mixture and this method is commonly adopted. Iodized salt is never recommended for pigs, because the animals do not eat enough salt to get the required amount of iodine. If desired, each sow may be given one 3-grain tablet of potassium iodide weekly.

A good, simple, and reasonably priced mineral mixture should be kept before the pregnant animals at all times. The mineral may be fed with the grain ration, but it is easier and just as effective to place it in self-feeders where the animals may help themselves. The vender of these products usually favors the force-feeding method because more of the mixture is consumed. Minerals are necessary to build bone in the forthcoming litter, but no swine-grower should be deceived by extravagant claims. Mineral mixtures will not increase the number of pigs in the litter, neither will they prevent the little pigs from becoming infected with hog cholera, necro, or scours. They will not prevent hairless pigs unless they contain the proper proportion of potassium iodide and they surely will not endow the sow or her litter with any special powers which they do not already

possess. Minerals help to make bone in the litter and maintain the proper mineral balance in the sow; nothing more can be expected of them. Minerals are sometimes sold as an easy way of preventing sows from aborting, but this claim is entirely without foundation.

In early autumn the breeding animals should be examined carefully for skin parasites such as lice and mange mites. If the weather is still warm they may be dipped, while later on during cold weather they should be hand-treated according to the directions in Chapter XVI.

FARROWING PREPARATIONS

It is always wise to keep an accurate record of the breeding dates of the sows in order that suitable farrowing places may be prepared. Memory often fails and a sow may farrow unexpectedly in any out-of-the-way place and some of the little pigs may be lost from exposure. Bred sows may be allowed to run together until about ten days or two weeks before farrowing time. This can be figured readily when it is known that a sow usually carries her young about 114 days. The sow should be placed in an individual farrowing pen at least a week before the pigs come, so that her new surroundings will not make her nervous. If she is to farrow outside on pasture, she should have time enough to get acquainted with her shelter. A calm and contented sow means bigger and better litters.

The floor of the house or pen should be scraped and then scrubbed with scalding water to kill all round-worm eggs. The liberal application of any good dip will make a fitting ending to the clean-up program.

The belly and udder of the sow should be washed with warm water and soap to remove any worm eggs or germs which may adhere to the skin. A clean sow in a clean pen will help in preventing early pen scours and worm infection. Only a few farmers practice these simple methods of prevention, but those are amply repaid in freedom from the worry of trying to cure these diseases after they get a start.

A scouring pig has little chance of recovery if the diarrhea is long continued.

Some sows are excitable or nervous after farrowing and frequently crush a few pigs. The sow may lay down and smother the little pigs between her body and the side of the pen. A simple way to avoid such losses is the use of what is commonly called a fender or pig rail. This is a 2 by 4 strip of lumber placed around the inside wall of the pen about 10 inches from the floor and 8 inches from the wall. This is an easy pig-saving measure which anyone can provide.

Clean short straw should be provided for litter, but no more than is necessary completely to cover the floor of the pen. Too much straw may cause the little pigs to become tangled up in the litter and thus not be able to move fast enough to dodge the sow when she lays down. Clean fresh straw should be put in every day for two or three weeks after the sows farrow.

The bowels should move freely and if there is any tendency toward constipation the sow should be given a handful of Epsom salts in the water or slop. A thin gruel composed of equal parts of shorts and bran will aid in keeping the bowels moving regularly.

THE LITTER

Some farmers sit up with sows about to farrow and are well repaid for their loss of sleep. It is natural for a sow to prefer seclusion at this time and, while she will usually farrow without help, it is well to be on hand when the unexpected happens. Young sows or fat older sows may need assistance. When the pigs arrive in cold weather in an unheated building, it is good practice to remove each pig as it is dropped. After it is carefully wiped and dried, it may be placed in a warm covered box. As soon as all the pigs are born, they should be returned to the mother and each one assisted to secure its share of milk. Unless the weather is severe and the building very cold, the litter should be left

with the sow. If this is not advisable, they must be kept in a warm place and returned to the mother for feeding every three hours.

Chilling is usually fatal to small pigs. Whenever possible, the place of farrowing should be warm. If this cannot be arranged, the new-born pigs should be placed in a box or basket containing a few warm bricks or a jug of hot water. The box or basket may be covered with a blanket or piece of carpet. Careful drying and rubbing helps to revive a chilled pig and assists in stimulating the circulation of blood.

When pigs fail to breathe immediately after they are born, the caretaker should wipe out the eyes and nose at once and then slap the sides of the pig briskly with the palm of the hand. If this fails to establish normal breathing, artificial respiration should be tried: grasp the front legs with one hand and the hind legs with the other; work the legs backward and forward in much the same way as a drowning man is resuscitated; continue as long as the heart keeps on beating. If the pig fails to breathe after five minutes, it will probably die.

When sows farrow normally, the afterbirth usually passes without any assistance. If the membranes are retained, it will require expert help to secure their proper removal. Fortunately, this is seldom necessary.

DIFFICULT FARROWING

As a general rule, most sows farrow without great concern on the part of animal or owner. If a sow labors for several hours without results, help should be summoned. It is always best to call a qualified veterinarian. Young sows or old animals that are too fat from over-feeding or lack of sufficient exercise are most likely to cause trouble. Sometimes immediate aid is not available and something must be done to relieve the sow. The following suggestions are given as a first-aid measure only, and with the understanding that the owner assumes full responsibility. The task is delicate

and should not be attempted when it is possible to secure prompt and expert help.

The reason for failure to farrow normally may be that the first one of the oncoming pigs has become twisted or blocked in the passage, and it is usually necessary to resort to mechanical means to remove the pigs and save the mother. There are many different types of patented forceps designed to extract the pigs. These may be purchased but, as a rule, they are never handy when needed most. A piece of straight number nine wire, 2 or 3 feet long, will do very well. One end of the wire is twisted to form a handle and the other is bent to form a hook. This instrument and a short length of strong twine or cord will complete the outfit.

Before attempting to use the wire hook, the caretaker should try to remove the pigs by hand. Possibly the trouble is caused by the first pig becoming lodged crosswise in the passage. If this pig is straightened and removed, the remainder of the litter may come without further aid. The hand and arm of the operator should be washed carefully and greased with vaseline. Introduce the hand into the vagina and proceed gently forward until the pig causing the blockade is reached. Do not rush the operation. Take plenty of time and handle the sow gently. When the pig is felt, an attempt should be made to straighten and remove it by hand. If this is successful, the operator should wait a few minutes to see whether the other pigs come without further assistance. When the remaining pigs fail to come, the hand operation may be repeated as many times as necessary. If the pigs cannot be removed by hand, the hook must be resorted to. This should be sterilized before use. The hands and arms are washed and greased and the hook passed into the birth canal. The hooked end of the wire is carried in with the hand and inserted under the jaw of the first pig. If the pig is in proper position to come, the operator may apply a gentle pull each time the sow strains. Cease pulling when the sow rests. If a wire hook is not handy the stout cord may be used to extract the pigs.

A loop is made in the end of the cord, carried into the sow, and slipped over the head of the pig. From here on the use of either the wire hook or the cord is the same. As each pig is removed, the operation is repeated as often as necessary to secure all the pigs. Care should be exercised to avoid injuring the sow.

It will seldom be necessary to perform this operation, because very few sows need assistance at farrowing time. If the brood sows are fed properly, given sufficient exercise, and supplied with laxative feeds for some days before they are due to farrow, most of them will deliver their litters without help.

FEEDING THE SOW AFTER FARROWING

After the sow farrows, she should be made as comfortable as possible and given plenty of fresh clean water to drink. If the weather is cold, the water should be warmed slightly, otherwise the sow may not consume a sufficient amount. As a rule, the little pigs will not be able to use all the milk of a good brood sow until they are two or three weeks old. On this account the sow should not be fed heavily during the first week after she farrows. After the first twenty-four hours she may be given a thin slop of bran, shorts, and oil meal daily. Three or four days later, some grain may be allowed in the ration. Grain should always be used sparingly and it may consist of equal parts of oats and corn. When the pigs are able to use all of her milk, the sow may be given a more generous ration. A thick slop made of shorts mixed with about 10-per-cent oil meal and plenty of skim-milk will promote milk secretion. Corn may be fed in reasonable amounts with the slop.

SUNLIGHT FOR LITTLE PIGS

Sunlight is the best and cheapest medicine for small pigs. It is as indispensable to pigs as human beings, and the newly-farrowed litter should be allowed the benefits of this free ultra-violet treatment. The practice of March or

early April farrowing usually deprives most litters of sunshine, because the early spring rays do not contain much warmth or ultra-violet light. When pigs farrow later in the spring, the sun is higher and the rays are more valuable. Early spring litters are usually born in a central hog house and the only way the little pigs can receive direct sunshine is to allow them to run in the old yard adjoining the house. Here worm eggs and germs abound and it is almost suicide to expose small pigs to such conditions. These infected yards are a fertile source of worm infection and it is here that many runts begin their unprofitable careers.

If later farrowing is practiced, the sow may be allowed to farrow in a clean pasture in a comfortable individual shelter. The use of a modern heated brooder-house is one way to combine reasonably early farrowing and at the same time keep the sow and her litter away from the old yards. Here the small pigs may have the advantage of direct sunshine without the danger that lurks in the soil about the central house. A clean playground pays good dividends in freedom from worms, necro, or scours. It is well known that disease germs do not live long in sunlight. Exercise on clean ground in the bright sunshine is better than several barrels of the best pig tonic ever manufactured. If kept clean, a fenced cement feeding floor adjoining the central farrowing house will serve as an excellent sun-porch.

When early-farrowing litters must be kept inside, they should be allowed to exercise for a few hours each day in the alley between the farrowing pens. The alley should be scrubbed at least once a week.

SCOURS IN SMALL PIGS

Scours is a common term for diarrhea. Many pigs are lost each season from this disease which is largely preventable. It is, however, impossible to guarantee a cure after the disease is well started in a litter, because the young of any of the domestic animals lack the vitality or resistance to

withstand several days of persistent diarrhea. Early spring litters are more likely to be affected because they are kept inside and it is very difficult to provide an effective system of sanitation. If the spring is wet and cold, this trouble may be disastrous to the pig crop.

Pigs may begin to scour any time after they are born, from one day to four or five weeks. Pigs kept in dirty pens where the litter is permitted to become foul are most likely to be affected. Lack of sunshine and cold weather may help to reduce the natural resistance of the animals and make them more susceptible. Pigs seldom develop scours when they are farrowed in a clean alfalfa field and have the benefits of exercise in the sunshine. Most cases of pen scours are due to infection with almost any of the germs commonly associated with filth. The combination of filthy pens and too close confinement in dark, dreary and chilly buildings is ideal for an outbreak of this disease. When one observes the conditions under which many small pigs are obliged to struggle for existence, one marvels that many live.

If the disease appears when the pigs are only a day or two old, it is possible that the diet of the sow may have some bearing on the outbreak. Over-feeding or sudden changes in the feed of the sow might upset the digestion of the pigs and cause fatal scouring. When pigs scour it is an indication that there is an irritant in the bowels and nature is striving to get rid of it. The irritant may be germs of some kind or it may be diet that has upset digestive processes. Whatever the cause, it must be removed before the pigs are able to recover. If the owner waits too long before treating the pigs, many may die from exhaustion.

Symptoms

The symptoms are usually unmistakable. Diarrhea is the chief outward sign, the discharge usually being thin, watery, yellowish in color, and very foul-smelling. The

tail and hind parts of the pigs are pasted up with these liquids and it is easy to understand how one pig may infect another when promiscuous licking takes place. If the pens are not cleaned and disinfected daily and clean straw supplied, the entire litter will eventually become infected and may die. After a day or two or scouring, the pigs may stop sucking and look very sick. The intestines are badly inflamed and painful, so that the pigs may squeal when handled. The back is arched and the pigs move gingerly. If the pigs are strong enough to stand the drain long, they soon lose flesh, become progressively weaker, and eventually die.

Treatment

The best treatment will do no good unless the pigs are immediately removed to clean quarters. These should be bright, airy, and dry. The litter should be kept clean if it has to be changed twice a day. On the chance that the diet of the sow may be the cause of the trouble, her feed should be reduced one-half at least, and she should be given a handful of Epsom salts. If this does not bring about an immediate change in the bowel movements of the pigs, each one should be given a teaspoonful of castor oil. Pigs over a week old may be given two or three times this amount. A good physic, together with the clean surroundings, usually helps in stopping an outbreak of this disease. One should not expect to cure pigs that have scoured so badly that they are about ready to die. No treatment will help them. If begun early, the above suggestions are often very effective. The owner who is not willing to go to the trouble of providing the clean pens and plenty of fresh litter will find that treatment is of little value. The castor oil removes the irritation contained in the bowels. If this is accomplished and clean quarters provided, those pigs that are not too weak stand a fair chance of recovery. Pigs suffering from a violent diarrhea might be given a small amount of

lime-water to allay the inflammation in the intestines. A tablespoonful of this daily should be sufficient. One-half dram doses of bismuth subnitrate may also be tried. There is no patent medicine that will take the place of cleanliness.

THUMPS

Thumps is usually described as a dietary disturbance of small pigs, but it is probably a symptom rather than a distinct disease. The exact nature of thumps is not well understood and, as a result, there are numerous opinions expressed as to its specific cause.

Due to the fact that early litters farrowed in close confinement often develop the disease, it is commonly claimed to be caused by too heavy feeding and lack of sufficient exercise. This may be true in rare instances, but no one has been able to explain why a pig should thump just because it happens to be plump.

Another and more probable reason for thumps is that the early and closely confined litters are often kept for weeks in pens that may be polluted with round-worm eggs, and it is easy to understand how they may become infected. Small pigs are very highly susceptible to round-worm infection and the worms in the course of their growth pass through the lungs. From this it would appear that many pigs exhibit the common symptoms associated with thumps because their lungs harbor many immature round-worms. It is at least acknowledged that a heavy infection of round-worms could readily cause pigs to show exactly the same set of symptoms.

Symptoms

The affected pigs breathe with difficulty and often show sudden and spasmodic movements of the flanks. Some may appear pot-bellied and sluggish. If the cause is worm infection, many of the pigs will later develop a staggering gait, cough, and eventually die or become runts.

Treatment

When the thumpy breathing is due to lack of exercise, this may be remedied by reducing the feed of the sow and permitting the litter to run in the alley of the hog house for several hours each day. The alley should be kept clean by scrubbing two or three times a week.

If the disease is caused by the lung stage of the round-worm, the sow and her litter should be moved at once to another clean pen or placed in a pasture which is known to be free from worm infection. No medical treatment is suggested at this time, because the tiny worms are located in the lungs and, therefore, out of reach. If the affected pigs are allowed to recover from the present attack of worms, it is probable that no ill effects will follow. It is the continual re-infection, day after day, that causes thumps to result in retarded growth or death.

METRITIS OR INFLAMMATION OF THE WOMB

Metritis is a technical term for an inflammation of the uterus. This disease is essentially the same as that which occurs so commonly in cows, but sows only rarely suffer from it. It is caused by an infection which may enter the womb at the time of farrowing or may follow the retention of portions of the afterbirth. Metritis may follow abortion in swine, but as yet this disease is not widely distributed. It might also occur after a case of difficult farrowing when unclean hands or instruments were used in the operation. A retained dead pig is reported to be another source of womb infection.

Symptoms

There is partial or complete loss of appetite and the animal usually carries a high temperature, often as high as 105° or 106°. The external genital organs are swollen and inflamed and there is frequently a putrid discharge. If a portion of the afterbirth of a dead pig is retained, the

sow may be observed to strain in an attempt to rid herself of this material. The failure of the sow to eat and the foul-smelling discharge from the vagina should enable one to recognize this disease. If nothing is done to relieve the animal, death often follows from exhaustion or general blood-poisoning.

Treatment

Metritis requires the attention of a veterinarian. This is especially true when the life of a valuable breeding animal is at stake. Keeping in mind that expert help is always indicated, the following suggestions are made as an emergency treatment only. Before the animal can recover, the womb must be emptied and then washed or douched with a mild antiseptic solution. The hand of the operator should be carefully washed and greased before it is inserted into the uterus. When this is done, the hand is inserted gently and any portions of retained afterbirth removed. The uterus should then be flushed with any mild household antiseptic. In preparing the solution always follow the directions given on the label of the container. A six-foot length of rubber tubing and an ordinary funnel will serve for the douching outfit. The tube should be sterilized by boiling before insertion into the animal. One end of the tubing is carried into the animal by hand. An assistant slips the funnel into the other end of the tubing and pours in the antiseptic solution. Repeat the treatment daily until the discharge ceases. Avoid the use of too strong disinfectants, because they will do more harm than good.

GARGET OR MAMMITIS

Garget is an inflammation of the udder. It is usually caused by germs which gain entrance through the teats. The habits and living conditions of sows make it comparatively easy for germs to enter, because the udder is in almost constant contact with mud and filth. Even with such excellent chances for infection, brood sows are only rarely

affected and are not as susceptible as dairy cows. In some instances the teat or udder may be injured and thus open the way for infection through cuts or scratches. Regardless of the way the germs enter the milk reservoir, it is conceded that this disease is of germ origin. Any of the germs found in filth might set up this disease.

Symptoms

The udder is hot, swollen, and painful to the touch. The teats may be so sensitive that the sow will not allow the pigs to nurse. There is also partial loss of appetite and the sow may appear feverish. If the disease has been in progress for several days, the udder may be hard or caked and the milk stringy or ropy. The heat and soreness of the udder, together with the altered appearance of the milk, will usually indicate garget. If the disease is long-standing and receives little or no attention, abscesses may form and discharge pus.

Treatment

Treatment for garget in sows is the same as for dairy cows. First, the bowels must be made to move regularly. This is accomplished by giving the sow a handful of Epsom salts in her drinking water. The remainder of the treatment is simple and often effective if applied early. Secure a pail of hot water, a bath towel and some olive oil or vaseline. Wet the towel in the hot water and after it is wrung out, apply it to the udder. Begin with mild heat and increase as the sow becomes accustomed to the warmth. Continue the hot applications for ten or fifteen minutes. After the udder is reddened, it should be greased with the oil and massaged for several minutes. Repeat the hot towels and massage twice daily until improvement is noted.

If abscesses form, they should be opened, drained, and swabbed with tincture of iodine. It is never advisable to inject antiseptic solutions into the teats. During treatment the animal should be fed laxative feed in the form of slop.

PIG-EATING SOWS

It is difficult to determine just why some sows eat their pigs. Many lay the blame to improper feeding, such as the lack of sufficient protein in the diet. There is a belief that some sows eat their pigs because of a depraved appetite which may follow when they are not supplied with sufficient animal protein in the form of meat meal or tankage. Some practical hogmen claim to be able to prevent pig-eating by feeding the sows raw meat occasionally. Most of the information bearing on this trouble is not well founded, but it would seem that a sow eats her pigs the first time because of faulty nutrition of some sort. After this the animal may acquire a taste for such a diet, so much so that it becomes an incurable habit. The common practice of allowing sows to eat their own afterbirth may give some animals an unnatural taste for blood. To remove such a cause, all portions of afterbirth should be buried or burned.

Sows guilty of such unmotherly actions should be sent to slaughter. As a matter of prevention it is sometimes advocated to feed the pig-eating sow raw meat or tankage during the period of pregnancy. This might be advised in the case of a valuable breeder, otherwise the animal is best disposed of. A well established habit of this kind is not easily treated. Slaughter is the safest way to prevent a recurrence.

HAIRLESS PIGS

Sometimes one or more sows give birth to pigs that are almost entirely without hair. These pigs also have a goiter in the neck, but it is not large enough to be visible through the skin. When the throat is opened, the thyroid gland is found to be several times its normal size. Enlargement of the thyroid and hairlessness in pigs always go together. Most of the pigs are dead at birth or die shortly afterward. The age of the sow does not have any bearing on the occurrence of the disease.

Hairlessness and goiter in pigs are caused by a deficiency of iodine in the diet of the sow, especially during the period of pregnancy. The crops in certain sections of the United States are lacking in this element and the shortage causes the pigs to be born without hair (Fig. 36). In some states



FIG. 36.—Sow with litter of hairless pigs. All are dead but two.
This condition may be prevented easily.

the losses have been so heavy as to cause the abandonment of swine-breeding.

The owner has no way of telling whether a sow will give birth to hairless pigs. The sow about to give birth to such a litter acts normal and the appearance of the dead or dying bald pigs is the first and only real symptom. Any farmer living in a section where this disease is common will do well to follow the simple means of prevention which always gives complete satisfaction.

Treatment and prevention

It is useless to attempt the treatment of one or more pigs that may be born alive. They will always be weak and unthrifty and will seldom repay the owner for the extra work required to raise them.

Hairlessness may be prevented easily by feeding potassium iodide to the brood sows during the entire period of pregnancy. Any drug-store can supply this chemical. The potassium iodide may be mixed with the feed or added to the regular mineral mixture at the rate of $\frac{1}{3}$ ounce of potassium iodide to 100 pounds of grain or mineral. A simpler way to feed iodine is to secure several hundred 3-grain tablets of potassium iodide and give one to each sow once a week. Some investigators advise more than this, but the work of Welch, of Montana, indicates that this amount is effective. Regardless of the way the potassium iodide is fed, it must be used throughout the period of pregnancy. To wait until the animal is a month from farrowing time is useless. Three months is about the shortest time iodine may be fed to secure good results.

CLIPPING TEETH

On some farms it is the custom to clip the points off all teeth as soon as the pigs are born. The reason for this is not well understood, unless it is thought to prevent the little pigs from biting one another or injuring the teats of the sow. This is a barbarous practice which should be discontinued because by far more harm is done than good. One or two pigs in some litters may have long sharp teeth and vicious dispositions. Such a combination might well cause trouble, but it does not follow that the teeth of all pigs should be clipped because of the bad manners of a few. The individual fighter in the litter should have his teeth attended to, but the others should be permitted to keep their teeth.

When teeth are clipped, care should be taken not to injure the gums, for this often results in an infection commonly called necro of the gums or sore mouth. When the gums

bleed, they should be painted with pure tincture of iodine to ward off possible infection.

Fighting appears to be common in large litters and in the mad scramble for a place to nurse, some of the pigs may develop a temper. A good test to ascertain whether the teeth hurt the sow would be to watch her as the pigs nurse. If she appears irritated and gets up and tries to avoid the pigs when they try to suck, the teeth of one or more need attention, otherwise they should be left alone.

Another superstitious belief among hogmen is that black teeth are bad luck and should be removed at all costs. Black teeth are simply devitalized or dead teeth and, if left alone, will fall out of their own accord. When such teeth are carelessly removed or broken off, the gums are frequently injured and bleed freely. Black teeth are harmless and should not be disturbed.

CHAPTER XVIII

VARIOUS OTHER SWINE TROUBLES

A NUMBER of ailments and practices are grouped together here, few of which are responsible for the death of many animals, but they are often a source of annoyance to the owner. Among these might be mentioned rickets, choke, piles, hernia, sunstroke, and posterior paralysis. While these may occasion the loss of a few animals, they seldom take the form of an epidemic. A description of castration may be unnecessary to most farmers because this is a common farm practice. It is included, however, for the benefit of the beginner.

Thousands of dollars are spent annually for minerals and various hog tonics. A brief discussion of these will help the reader to understand their limitations. Salt poisoning should be interesting to all owners of hogs, because it is of common occurrence and, when deaths take place, the real cause is sometimes overlooked. Other comparatively rare diseases might be described, but it is thought best to include only those frequently encountered.

CASTRATION OF SMALL PIGS

All male pigs not intended for breeding purposes should be castrated at an early age. A castrated pig is thereafter called a barrow and his position in the herd is much the same as that of a capon or castrated rooster. Both fail to assume further male characteristics and tend to resemble females as far as their physical appearance and disposition are concerned.

The best time to castrate small pigs is two or three weeks

before they are weaned. The operation is a shock and it is always desirable that the pigs recover from this before they are subjected to their first change of life, namely weaning. Small pigs are easier to handle and usually recover from the operation quickly. Experiments have proved that pigs castrated before weaning lose very little weight as compared to those castrated some time after weaning. The little pigs show almost no after-effects while the older ones may become stiff and lose considerable weight because of a reduction in the normal consumption of feed. As a rule, pigs castrated while sucking do not miss any meals and consequently a loss in weight is not apparent. When early castration is practiced, the wounds heal faster and there is less chance of the pigs being stunted.

The loss of blood at the time of the operation is slight because the blood-vessels supplying the testicles are still small and do not bleed as much as those of older pigs. Then, also, if the operation is delayed until long after weaning, breeding may take place. There is some difference of opinion as to whether castration should be performed before



FIG. 37.—Making the first cut in castrating a pig. The skin is tightly drawn over the testicle.

or after weaning, but the concensus is that before weaning is the best and safest time.

While pigs may be castrated at any time of the day or year, it is usually best to choose a warm sunny day in early spring or late fall, depending on whether spring or fall animals are to be castrated. If possible, dark, chilly, or rainy days should be avoided, as in the castration of lambs. Flies will not be so numerous and maggot-infested castration wounds may be avoided. Maggots are caused by the eggs of flies which are attracted by the odor of a festering wound.



FIG. 38.—Pressing the testicle through the first incision.

Preparing for the operation

It is always good practice to reduce the feed for twenty-four hours before the operation is performed. If the pigs are nursing, no change of

feed is necessary. Older pigs receiving grain should have their rations markedly reduced. The stomach and intestines should never be engorged with feed for best results.

The necessary equipment is very simple. A pail of mild

antiseptic solution should be provided for cleansing the skin. This may be made from any of the common household disinfectants, but care should be taken not to have the solution over 2 per cent in strength. If stronger than this, it is likely to irritate the skin or wound to which it is applied. In preparing such solutions it is always advisable to follow the directions printed on the label of the container. Another pail filled with warm water, soap, and a stiff brush to scrub the skin before applying the antiseptic solution will serve to prepare the animal for the operation.

A sharp knife is the only instrument needed, although Fig. 40 shows the testicle being removed from its cord attachment by means of an emasculator. This is a pincer-like instrument which crushes and severs the cord at the same time. One might dispense with the emasculator and sever the cord by scraping it with the edge of the knife-blade.

If the owner is in the habit of castrating a large number of pigs each year, it would be well to secure one of these especially designed instruments. They may be purchased from any stockman's supply house. When very small pigs are castrated, the knife-blade does fully as well, because the tiny blood-vessels do not bleed much. The regular



FIG. 39.—Pulling the testicle through the opening in the skin.

emasculator would be an advantage in preventing excessive hemorrhage from older pigs. The crushing action of this instrument causes the cut ends of the blood-vessels to be

squeezed together and stops bleeding. The knife or emasculator should be boiled before use and kept in a pan of disinfectant solution.

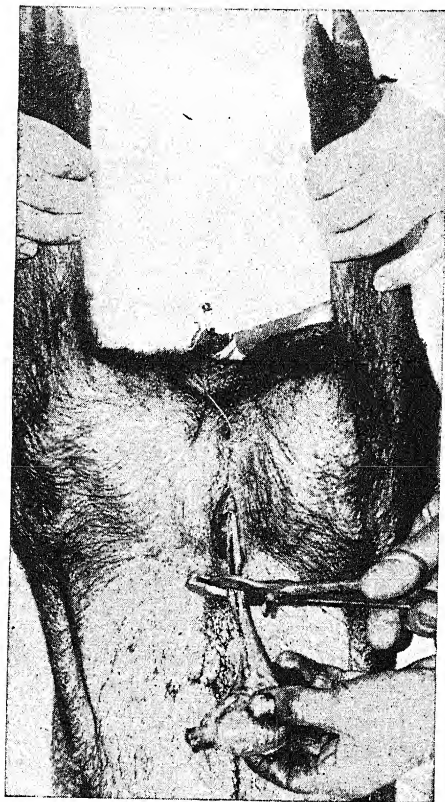


FIG. 40.—Severing the testicle with the emasculator. It may also be scraped through with the edge of a knife.

Performing the operation

The pigs to be castrated should be confined in a pen or other inclosure where they may be caught without violent exercise on the part of man or animals, a place as free from dust and mud as possible. The assistant will hold the pigs by the hind legs in the position shown in Fig. 37, with the rump held firmly between the assistant's legs.

The testicles are easily located and the skin over them should be washed with soap and water, dried, and then bathed with the mild antiseptic solution. It is not necessary to shave the skin over the testicle. The operator now grasps the testicle farthest from

him and holds it securely with the thumb and fingers, at the same time stretching the skin as though he expected to pop the testicle through it. Without faltering and with only one swift stroke of the knife, a cut is made parallel to the middle line and directly into the testicle. The incision or cut should be long and low enough to allow plenty of drainage when the animal stands on its feet.

After the incision is made, the testicle is exposed and may be pressed through the opening in the skin as illustrated in Fig. 38. The next step in the operation is to draw the testicle with its attachments through the opening, as shown in Fig. 39. The testicle is now in position for severing from its attachment to the body.

With the testicle in proper position for removal, the remainder of the operation is simple. The emasculator is slipped over the cord, as pictured in Fig. 40, and crushed off. When the knife is used, the cord is severed by slowly scraping and twisting it until the testicle is separated from its attachments. The bleeding is usually very slight by

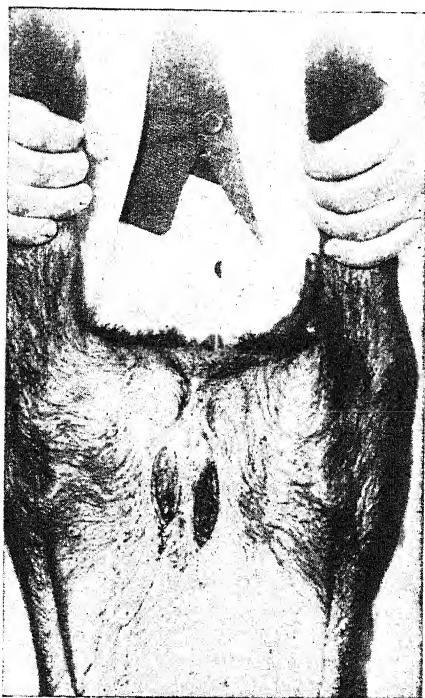


FIG. 41.—Two clean skin wounds after both testicles have been removed.

either method. After the first and farthest testicle has been removed, the one nearest the operator is taken from the animal in the same manner. It is always necessary to make two incisions. The appearance of the completed operation is shown in Fig. 41. If the work is carefully done, there should be no scar or blemish to the skin when the animal is viewed from behind.

After-care of the pigs

As a rule, it is unnecessary to apply a dressing or antiseptic to the castration wound. In fly time it is an added precaution to smear pine-tar about the wound opening to prevent the attacks of maggot flies. If the operator's hands and instruments are clean, no infection should follow. Infection is usually evidenced by swelling of the wound area a few days after the operation. Infection by any of the common hog-lot germs may be largely avoided by placing the sow and her litter in a grassy pasture or at least in some place reasonably clean and free from old and infected mud wallows.

If infection by germs or maggots should take place, the wound must be washed and dressed as is any open wound. When an abscess forms, another cutting operation may be necessary to remove the pus and allow better drainage. This is followed by frequent antiseptic washes. Maggots may be flushed out with any antiseptic solution. It is sometimes advisable to pick them from the wound with forceps, cleanse the wound carefully and smear it with a liberal amount of pine-tar.

RUPTURE

A rupture or hernia is the passage or dropping of a loop of the intestine through the abdominal cavity into the scrotum or bag containing the testicles (Fig. 42). There are other types of hernia, but this form is more common and is usually referred to as a scrotal hernia. There is a natural opening from the abdominal cavity into the scrotum

through which the blood-vessels supplying the testicles pass and when this opening is larger than normal a portion of the intestine sometimes drops through. This causes a marked enlargement of the scrotum and a pig in this condition is often said to be ruptured or "busted."

When ruptured pigs are castrated, care must be taken not to cut into the prolapsed portion of the intestine. After the incision is made, the ruptured part of the bowel must be pushed back into the abdominal cavity. This is done by holding the pig by the hind legs as in the regular castration operation. When the incision is properly made, the intestines may be gradually pushed back through the opening. The testicles are then removed by the usual method and the opening into the abdominal cavity is carefully sewed together to prevent the bowel from dropping through again.

A detailed description is not given because this is a precise surgical operation and requires a knowledge of the anatomy of this part of the pig. Whenever numbers of pigs are affected, it is best to call a veterinarian to perform the necessary operation. The value of such pigs is questionable and it may not pay to attempt the treatment of one or two animals.

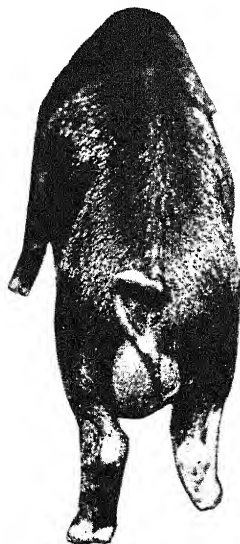


FIG. 42.—Pig with a large scrotal hernia. It may be relieved by a rather delicate operation.

PILES

This condition in man is usually called hemorrhoids. Piles in pigs is not the same, because the blood-vessels of the rectum are not engorged and bleeding. In swine, piles

is simply an eversion or turning wrong side out of the rectum. It is thought to be caused by chronic constipation or a diet which is irritating to the lower bowel. The continued and violent straining to pass manure sometimes causes the rectum to turn inside out.

At first only a small part of the rectum may protrude, but later, with further straining, several inches may be exposed. The rectum appears as a dark red or black swollen mass which bleeds from bruising and tearing. The animal is able to pass little or no manure and soon a loss of appetite is noticed and the pig may appear feverish. If the animal is uncared for, infection may set in and death often follows from a general blood-poisoning.

The success of home or first-aid treatment is not always assured. If the animal is attended to in the early stages it is sometimes possible to effect a cure. The protruded part of the rectum should be washed with warm water, greased with glycerine or olive oil, and replaced by gently pressing it inward with the fingers. The operator's hands should be carefully cleansed before beginning treatment. After the prolapsed portion has been returned to its normal position, an enema may be given to flush out the lower bowel and remove any accumulation of feed which may cause further straining. All feed should be withheld for a day or two. After this the animal should be given an easily digested laxative diet, consisting mainly of thin slop and bran mashes.

If the protruded portion of the rectum is much swollen and infected, it may be impossible to replace it at all. In this case it is advisable that the part be amputated. This calls for good veterinary service and, when properly performed, the results are usually satisfactory if the operation has not been delayed too long.

When several pigs begin to show signs of this trouble, the diet should be investigated and, when necessary, it may be changed to include more laxative feeds. In the early stages the simple hand replacement is effective, but if the animal has been neglected no treatment is likely to be satisfactory.

CONSTIPATION

Hogs are rapid eaters and frequently bolt large quantities of feed without sufficient mastication or chewing. If the feed contains a large amount of fibrous or indigestible matter, the stomach and bowels may become packed with a mass of this dry material. Digestion moves too slowly and the disease takes on the nature of an impaction or stoppage of the bowels.

The constipated animal often moves stiffly and may show signs of pain, as evidenced by grunting and frequent attempts to pass manure. It is said that some constipated hogs assume a squatting position similar to that of a dog. The bowel movements are usually very scanty and dry. The animals move with arched back and mincing gait. If the attempts to pass manure are violent, such straining may result in piles.

To relieve the animal it will be necessary to take away all feed, but supply plenty of clean drinking water. A good physic in the form of a small handful of Epsom salts should be given in the drinking water.

When normal bowel movements are secured, the animal should be fed carefully for a few days, using easily digested and laxative feeds, such as bran mashes and slop.

CHOKER

Choking is caused by the blocking of the œsophagus or gullet. It may result when hogs attempt to swallow too large objects such as potatoes, turnips, pumpkins, apples, or even bones. Hogs are notoriously greedy feeders and a condition of this kind is not uncommon.

The choking animal refuses further feed and may stand with its head close to the ground, mouth open, and drooling. It may retch frequently and try to dislodge the object by vomiting. If the passage is blocked by something like a large potato, breathing may be difficult and saliva flows freely from the mouth. When cattle and horses choke, it is often possible to locate the object in the neck by manipulation with the hands, but the neck of a pig is

heavily muscled and such an examination is very unsatisfactory. If the object is located, hand massage may help to dislodge the obstruction either upward or downward.

If the choke is high up in the throat or in the back part of the mouth, it is sometimes possible to remove it with a long pair of forceps, or by hand when a speculum is used to hold the mouth open. Should the stoppage be located far down in the gullet, the chances for recovery are not good, because it is always difficult to force the object downward. It is also dangerous to use oil, because it may gag the animal, enter the windpipe, and cause suffocation.

When hand manipulation fails and it has been found impossible to extract the object with forceps, the pig may be given a very small amount of any household oil, such as olive, castor, or a salad oil. This is a last resort and may grease the throat sufficiently to allow the mass to be vomited or swallowed. The oil is given at the owner's risk and with the idea that the animal will probably die if the choke is not relieved.

Choke in pigs is always serious and whenever possible the services of a veterinarian should be enlisted. This is especially true in the case of a valuable breeding animal. His knowledge of the anatomy of the throat will be invaluable in accomplishing mechanical removal of the object.

RICKETS

Rickets is a disease of young animals and is popularly referred to as softening of the bone. It very seldom causes the death of pigs, but results in unthriftiness and such animals are rarely, if ever, profitable to the owner. Rickets sometimes occurs in epidemic-like form, when large numbers of individuals in a herd become affected. All breeds of swine suffer alike when conditions are favorable for its development. Rickets is not to be mistaken for paralysis.

Cause

Rickets is generally believed to be caused by a lack of

bone-forming minerals in the diet or possibly some bodily disturbance in the animal prevents the proper amount of lime-salts from being deposited in the bones. Too close confinement in dark dreary pens has brought on the disease under experimental conditions in much the same way that leg-weakness is produced in baby chicks. The crops grown in certain sections may be lacking in the normal amount of mineral matter. If water contains an excessive amount of magnesium sulfate (Epsom salt), this may prevent the normal assimilation of the calcium in the diet. A shortage of both calcium (lime) and phosphorus often causes animals to break down.

When grain is fed too heavily without the addition of a calcium supplement, such as alfalfa, bone-meal, or a good mineral mixture, rickets may occur. A scarcity of vitamin D in the ration is another contributing cause, when animals do not have access to abundance of green forage, such as alfalfa. Rickets may be induced by too close confinement without the benefits of the ultra-violet rays of direct sunshine and a diet lacking in the necessary amount of calcium, phosphorus, or vitamin D. It is usually difficult to recognize mineral deficiency in older animals until the disease is well advanced, because they seem to possess a reserve supply which takes care of their needs for a long time, even though the feed is lacking in the required elements.

Symptoms

Before the changes in the bones are noticed, the animals may show some evidence of depraved appetite, as indicated by chewing sticks and stones. As the disease develops further, nervous symptoms are sometimes observed in the form of convulsions. A few animals are reported to have died in this stage, before lameness and bone deformities made their appearance.

As the disease progresses, the owner may note stiffness and soreness of the joints, which become steadily worse, until the animal moves as though in considerable pain. Some

animals lie down most of the time because of the discomfort of standing or walking. When forced to rise, a few may walk on their front feet and drag the hind parts (Fig. 43). These symptoms do not appear rapidly, but take weeks or months to develop fully. The tendency to drag the hind parts is not thought to be a true paralysis, because there is no loss of feeling in the hind legs. The refusal to use the hind legs is believed to be caused by the pain which accom-

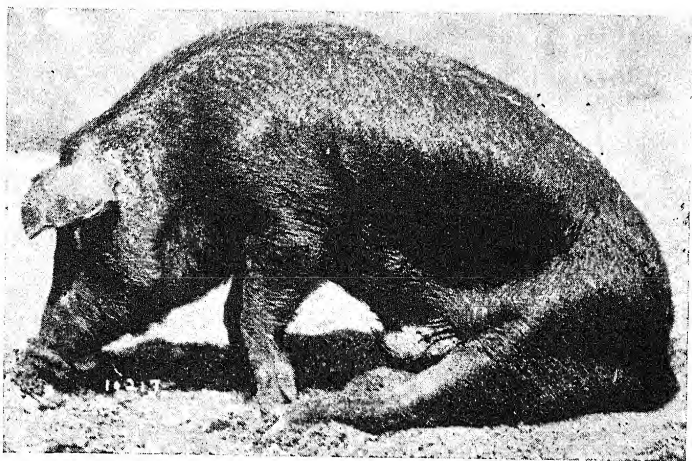


FIG. 43.—Pig suffering from a mineral deficiency known as rickets.

panies any movement of the joints. Paralysis is usually a disease of older animals while rickets is essentially one of young pigs.

Treatment and prevention

There is no specific medicine to cure pigs after they have suffered from rickets for a long time. All animals far enough advanced in the disease as to be unable to walk should be destroyed. It is possible that a few animals in the early

stages may be benefited by proper feeding, but no assurance of this can be given.

Rickets should be regarded as a preventable rather than a curable disease. When it occurs on a farm, steps should be taken to prevent other animals from becoming affected. Young pigs should be placed on green pasture, preferably alfalfa, where they may have direct sunshine. A well-balanced mineral mixture may be purchased from a reputable dealer or home-mixed. An acceptable mineral supplement may be prepared easily by mixing 20 pounds of common salt, 40 pounds of bone-meal or spent bone-black, and 40 pounds of air-slaked lime. If some sows have given birth to hairless pigs, $\frac{1}{2}$ ounce of potassium iodide may be added to the mixture. Each animal will consume about one pound of the mixture a month. A mineral mixture should not be considered a medicine designed to cure any disease, but a necessary part of a diet to be fed regularly.

PARALYSIS OF THE HIND PARTS

Sometimes one or two individuals in a herd lose the use of their hind legs. This form of paralysis may affect animals of all ages. Several theories have been advanced as to the exact cause, but no one factor seems to be responsible for all cases.

Rickets of young pigs may give rise to symptoms of paralysis when the disease is well established, but the inability to use the hind legs may be due to the pain involved when the legs are moved. In true posterior paralysis there is almost, if not complete, loss of muscular control and, even though an animal is able to struggle to its feet, it is not able to direct its movements. After frequent ineffectual attempts to walk, the pig usually becomes resigned to its fate and drags itself about the lot with the front legs only. The appetite remains good and the animal appears as healthy as ever if it is able to reach the feed without too much effort.

Among the causes commonly given for this disease might be mentioned tuberculosis of the spinal cord, injuries to the back bone, and kidney-worms. Tuberculosis or injuries to the spine might bring about paralysis, but the kidney-worm theory is doubtful, especially when this form of paralysis occurs in sections where kidney-worms are rare. It is probable that future investigations will disclose the exact cause if it should be specific.

Symptoms

As a rule, posterior paralysis begins gradually. The first sign may be nothing more than an uncertain gait which later causes the animal to stumble. As time goes on the loss of muscular control of the hind legs becomes more pronounced and the animal may fall to the ground. After many trials the hog finally gives up and accepts the situation without further struggle. It may stay in fairly good flesh until the effort necessary to drag its body about the yard becomes a burden and the animal does not take sufficient food to maintain itself. From this time on there is a gradual wasting away in flesh until the pig dies from starvation or exhaustion.

Treatment

There is no cure for this disease. It is useless to resort to drugs or other forms of treatment. Mineral feeding has been advocated as a treatment for this form of paralysis, but it is by no means a specific cure. At the first well-defined symptoms of paralysis the animal should be butchered while it is still in good condition.

RHEUMATISM

Rheumatism is a vague and uncertain term frequently used to describe almost any degree of lameness. The lameness may be caused by an infection of the joints only or it may appear as a complication of some other disease such

as rickets. Many cases described as rheumatism are doubtless the sequels of some other disease.

The common understanding of rheumatism as a distinct disease is an inflammation of the joints which results in stiffness and lameness. When the muscles are affected, it is called muscular rheumatism, although it would be rather difficult to distinguish between these two forms.

Without any pretense of positiveness it may be assumed that rheumatism is the result of some infection which attacks the joints. In man rheumatism is associated with an infection of the joints extending from some other center, such as diseased tonsils or teeth. A similar condition may exist in pigs. It is often stated that rheumatism follows exposure to cold or close confinement in damp quarters, together with lack of sufficient exercise.

The outstanding sign of rheumatism is lameness. The joints are often swollen and the animal shows evidence of pain when it moves. The gait is altered and the movements are always slow and deliberate. Some animals spend most of the time lying down and consequently there is soon more or less loss of flesh caused by failure to take nourishment regularly.

Treatment

There is no sure cure for animals badly affected with this disease, although in the early stages some recommend giving each affected hog 15 grains of sodium salicylate once each day. This amount is suitable for each 100 pounds of live weight and an animal weighing 200 pounds would, therefore, receive 30 grains daily. This medicine may be given in the feed or water.

No treatment would be effective without a change of quarters, if the present ones are damp and cold. Provide plenty of clean dry straw and make sure the animals are housed in a well-ventilated place. Whenever possible, allow plenty of exercise. Good nursing in dry quarters is usually the best form of treatment.

SUNBURN OR SUNSCALD

Trifoliosis is the European name for a disease of light-skinned hogs which farmers usually call sunburn or sunscald. The exact nature of the disease is not well understood, other than it is a sensitization of the skin from contact with the wet leaves of alsike clover or rape. This exposure must take place while the sun is brightly shining on the leaves dripping with dew or rain. Some hogmen report that burning may occur on a sunny day, even though the clover or rape is not wet. The disease is also called dew poisoning.

In most instances sunscald is seen when hogs are turned into a rape pasture in the morning after a heavy dew or shower during the night. If the sun is bright and warm, the skin of the white or red pigs soon begins to burn and blister. All parts of the skin that come in contact with the wet leaves and afterward are exposed to sunshine may be affected. Black animals may be allowed to run in such pastures, even after rain or dew, without any ill effects. If animals are permitted to remain in these wet pastures when thunder-storms alternate with sunshine, serious skin sores may develop. The blisters break and leave sores which often become infected. At times, portions of the ears and tail may burn, blister, and even slough off.

The treatment is to remove the herd immediately from the wet rape or alsike pasture. If the hogs are badly burned, the sores may be treated with zinc ointment or carbolized vaseline once or twice a day. If the burning is discovered early, no treatment other than removal of the herd to another safe pasture is necessary.

COCKLE-BUR POISONING

Cockle-bur is probably the commonest plant poison affecting hogs. The plant is widely distributed through the United States, growing most luxuriantly near the banks of streams, roadsides, and other moist places. It is a coarse annual with broad leaves and stands from 1 to 3 feet tall.

The seed-pods are oval-shaped prickly burs and are the most noticeable feature. The burs range from $\frac{1}{2}$ to $1\frac{1}{2}$ inches in length, each pod or bur containing two slender greenish seeds. These lie side by side with a partition between. The wild licorice bur is similar to the cockle-bur, but the seed-pod of this plant is smaller and contains three or four pea-shaped seeds.

The adult or full-grown cockle-bur plant is not considered dangerous. Poisoning takes place only when pigs eat the young sprouts. In the spring many small streams overflow their banks and supply the necessary moisture for the seeds to sprout. Warm weather and moisture are favorable for the growth of young cockle-bur plants. The tiny sprouts are very palatable and when pigs have access to places where they are abundant, they often consume large quantities of the juicy leaves and stems. When in doubt as to the identity of the sprouts, they should be pulled up and the roots examined for their attachment to the cockle-bur.

Hogs are the principal sufferers from cockle-bur poisoning, but cattle and sheep may eat them and be poisoned if other safe forage is not at hand. While the young sprouts are the only poisonous part of the plant, hogs sometimes eat large quantities of the unsprouted burs and die from overloading the bowels with a mass of indigestible seed-pods.

Symptoms

The first warning of trouble may be the finding of several hogs dead near the place where the sprouts were eaten. In other cases the sick pigs may show evidence of great thirst, pain, and diarrhea. Some pigs may vomit, become paralyzed, and lie in a semi-unconscious state. Animals that have eaten large quantities of the sprouts are seldom sick more than a few hours. When examined after death, the stomach and intestines are usually found to be stuffed with cockle-bur sprouts. The lining of the digestive tract is usually very much inflamed or reddened. Death is caused

by the absorption of a poison secreted in the tender leaves and stalks of the sprout.

Treatment

It is impossible to save animals that have eaten quantities of the sprouts. Many may be near death when discovered and no drug treatment is of value. If the hogs are discovered eating the sprouts before the poison has had time to be absorbed, they should be removed from the dangerous pasture and given as much whole milk as they will drink. The fatty part of the milk has a tendency to neutralize the poison or prevent its absorption. Later, each animal should be given a physic, such as a small handful of Epsom salts.

It would be an added precaution to make a survey of the farm and try to locate all the places where the cockle-bur plants grow. The young sprouting plants may be destroyed by spraying with salt brine made by dissolving 2 pounds of common salt in 1 gallon of water. The seed-pod of the cockle-bur contains two seeds, but only one germinates the first year. The other remains to grow another year.

SALT POISONING

Most farm live-stock tolerate reasonable amounts of salt, but swine are easily poisoned when salt is not used regularly in the feed. When deprived of salt for a long time, pigs may eat more than is good for them if a salt box is placed within reach. It is said that the poisonous dose of salt for swine is from 4 to 8 ounces, but there are many reported cases in which animals have died after eating much less than this. Salt should always be fed to swine with great caution and in small amounts. The author recalls an instance where over a dozen hogs were poisoned because the brine from an ice-cream freezer was emptied near the house and some of the animals running loose about the farmyard drank most of it. Pigs like the taste of salt and, if permitted to satisfy their own desires, may eat far

too much. Meat brine and garbage containing quantities of salt have caused the death of many hogs. Pigs turned into a pasture where cattle have been may eat too much salt from a trough which was placed there for the cows. When salt is fed to swine, it is always safer to mix it with feed or give it as part of a mineral mixture. If salt is put out in boxes, there is always danger of the animals eating too much.

Symptoms

Often it is impossible to observe the symptoms, because it is not suspected that some animals have eaten too much salt until a few are found dead or in the last stages of poisoning. If, on investigation, it is learned that the animals have eaten an unusual amount of salt, one may proceed on this supposition and study the symptoms further. Some hogs have been known to die within four or five hours after the salt was eaten. Pigs suffering from salt poisoning may show evidence of extreme thirst together with a wobbly and uncertain gait. The eyes may be staring and the breathing much faster than normal. Salt causes a severe inflammation of the stomach and bowels and this may lead to convulsions. Frothing at the mouth is another fairly constant symptom. Later the sick animals may appear much depressed and finally lie down as though paralyzed and death soon follows.

When taken in large quantities, as in a brine, salt causes an intense inflammation of the digestive tract. The lining of the stomach and intestines is usually very red and even bleeds in severe cases. The history of the animals having had access to salt or brine together with the symptoms and post-mortem examination should enable one to make a reasonably safe diagnosis.

Treatment

Drugs for the treatment of salt poisoning are of very little value. A light mineral oil is suggested to sooth the

lining of the stomach and bowels, but the value of this as an antidote is not always great. When large amounts of salt have been consumed and the animals are in a stage of prostration, the chances for their recovery are slight. Animals that have eaten small quantities of salt may recover after a long period of convalescence.

SUNSTROKE OR OVER-HEATING

In midsummer, during a period of excessively warm weather, hogs may suffer from what is commonly called sunstroke. The prostration may, however, be due to over-heating, because it is impossible to distinguish between these two conditions.

When hogs are exposed to the direct rays of the sun in humid summer weather, a few may succumb and die. When driven for long distances or crowded into wagons or trucks and hauled to a shipping point on a warm day, several animals may be affected by the heat.

Symptoms

In some cases the chief and only symptom is the total collapse of an animal. It may be found in a half-conscious condition and gasping for breath. In the early stage of heatstroke an animal may appear uneasy, breathe rapidly, and after a period of weakness finally die in convulsions. The temperature may rise very high, sometimes as high as 108° or 109° F.

Treatment

Animals found in a state of unconsciousness seldom, if ever, recover. If the sick animals are discovered before they become even partially paralyzed, they should be removed to a shady place and cold water thrown over their bodies. The application of a gunny-sack filled with cracked ice to the head is often helpful. A shady place should be selected where there is a breeze or at least some movement of air. The animals are far better off out-of-doors

than in a close humid building. The cold water or ice treatment may be continued until signs of improvement appear.

Hogs will stay out of the sun on a hot day if a shady place is available. In open pasture without trees artificial shade should be provided. On an especially warm day the owner should visit the herd at intervals and, if the animals appear to be suffering from the heat, should haul out a tank of water and give them a sprinkling.

MINERAL FEEDING

Mineral feeding may fall into disrepute unless owners of swine understand its limitations. Practically all agricultural colleges and experiment stations have recommended mineral feeding and, as a result, the sale of these products has been pushed to extremes. The well-informed farmer should be acquainted with the facts and when in doubt as to the advisability of feeding this or that mineral for the prevention of disease should consult a qualified veterinarian or his own state agricultural college.

Minerals are not intended to be used as a medicine for the treatment of any disease. They are employed to make up for a deficiency of certain minerals, such as calcium, phosphorus, and sometimes iron. Crops grown on some soils are lacking in the normal amount of these minerals and, when this condition exists, hogs and other live-stock may suffer. The water supply also is frequently short in some mineral constituents or it may contain too much of other elements, such as magnesium sulfate. This shortage of minerals in the crops and water, together with present-day methods of heavy feeding, contribute to the prevalence of a disease such as rickets or depraved appetite. Mineral deficiency does not cause sows to abort, but a diet low in minerals may cause some animals to become irregular breeders. Minerals should be used as a feed supplement and for no other purpose.

Since mineral feeding became popular, innumerable absurd

claims are made for it. It would take far too much space to enumerate even a few of these mis-statements. It will suffice to say that the feeding of a good mineral will not make any difference in the susceptibility of pigs to worms, hog cholera, necro, or any other contagious or parasitic disease, and any farmer who feeds the same in the hope of reducing his losses from such disease is laboring under a delusion.

To aid the worm prevention properties of some mixtures, a small amount of copperas or some other vermifuge is included. This is supposed to expel worms. Such a method of worm eradication is out of date. Worms can only be controlled by proper handling of the small pigs under four months of age and the individual treatment of the older infested hogs with a recognized worm expeller. The addition of drugs to the slop or grain feeds is not considered an effective way to rid hogs of worms.

It is unfortunate that a good feeding practice is being disregarded by many growers of swine because of over-exploitation. The man who buys a mineral mixture under the impression that it will help to prevent or cure necro soon finds it to be worthless for this purpose and may later refuse to use it even when indicated in the prevention of rickets.

The owner of hogs is advised to keep a simple mineral mixture before his herd at all times, placed in self-feeders and the animals allowed to help themselves. Mineral mixtures will not cause the animals to make miraculous gains or increase the number of pigs in a litter. A simple home-made mixture is composed of 20 pounds of common salt, 40 pounds of bone-meal or spent bone-black and 40 pounds of ground limestone or air-slaked lime. When needed to prevent hairless pigs, $\frac{1}{2}$ ounce of potassium iodide may be included. If it is desired to make the mixture more palatable, tankage may be added. The animals will eat considerably more of this mixture in order to satisfy their craving for tankage.

HOG TONICS

Any hog tonic or conditioner is entirely unnecessary. Hundreds of thousands of dollars are spent annually on these shot-gun prescriptions or cure-alls for which the user receives little in return.

Hogs kept in reasonably sanitary surroundings and supplied with plenty of good feed are never in need of tonics. When they appear to need a tonic, probably they are suffering from worms, necro, or some other disease. Pigs may need attention and perhaps medical treatment either by the owner or a veterinarian, but the promiscuous feeding of a conglomeration of drugs mixed with some inert base is entirely useless. The modern and well-informed grower of swine takes advantage of trustworthy information in respect to sanitation and feeding and has learned that the use of tonics can never replace these fundamentals of successful swine husbandry.

PART V

DISEASES OF POULTRY

CHAPTER XIX

CONTAGIOUS DISEASES OF POULTRY

UNDER the general system of management on most farms, poultry diseases may cause severe losses. It is almost useless to advocate sanitation when the entire farm flock, including baby and older growing chicks, has the run of the farmstead. Disinfection under such circumstances is impractical, because the germs of any disease may pollute the soil about the buildings, making a careful clean-up program impossible. Perhaps the time will come when the farmer or his wife can be persuaded to confine the flock in yards which can be rotated from year to year. In this way a clean yard may be provided each season and the one in use the previous year may be allowed to rest by plowing and sowing it into garden. Birds do fully as well, if not better, when confined to a range of reasonable size, and the physical appearance of the ground about the farm home and buildings is vastly improved. In many cases the chicken house is situated in dense shade where sunlight seldom reaches even the outside. Shady places are always favorable for the protection and multiplication of germs or parasites such as worms. Sunlight is the most valuable soil disinfectant and should be more utilized.

The chicken house should be placed some distance from the other buildings, with enough open space about it to pro-

vide at least a two-year rotation of yards. If this range is changed from year to year and plowed during the intervening year, real progress may be made in the control of common diseases such as tuberculosis and worms.

The general use of brooder-houses is increasing. Finances permitting, no one should attempt to raise a large number of chicks without the advantages of such a house. A brooder-house may be built at no great outlay of money and the owner will be more than repaid for the trouble and expense the first year. The baby chick industry has been increasing rapidly, and it will not be long before most farm wives will buy the chicks already hatched from the commercial hatchery. This saves labor and insures the receipt of any desired number of live chicks. The birds are more likely to be uniform in breed and color and, if the proper facilities are available when the chicks are received, the larger percentage of the birds should be raised.

Baby chicks should never be raised with older fowl or on ground where the old flock runs. The brooder-house should be hauled out to some nearby field and the young birds kept there until they are at least four months of age. If allowed to run with the old flock or if the brooder-house is close to the old chicken house, the young chicks may soon become infected with worms, coccidiosis, lice, mites, and even tuberculosis, although they may not show signs of this disease until late in the fall or winter. It should be remembered that young birds are always more susceptible to worms and coccidiosis, but as they grow older they become increasingly immune to these diseases. After they reach the age of three or four months, they develop sufficient resistance to make the danger of infection very slight. The poultryman's motto should be "raise the little chicks in brooder-houses at least 200 yards from the farm buildings until they are four months old." Of course it is understood that the usual sanitary practices must be carried out, even though the brooder-house is at some distance from the farmstead. This refers to the daily cleansing and disinfect-

tion of feeding and drinking utensils and the regular change of litter.

It does not pay to treat one or two sick birds. There are no specific cures for any of the common poultry diseases and the flock owner is advised to kill a sick bird and take no chances of the spread of the disease. It is useless to smear vaseline, turpentine, or kerosene about the head of a bird whose eyes are swollen shut with roup. The bird probably will not be profitable even though it finally recovers. Whenever treatment is attempted, the sick birds should be removed to other quarters.

Except in cases such as roup it is usually impossible to ascertain the particular disease affecting the bird unless a careful post-mortem examination is made. Sick birds are usually described as "droopy." This means that the bird appears ill and nothing more. When chickens die, one should open a few and compare notes with a good bulletin or some other description of the disease suspected. Always open a bird before it has had time to decompose. In warm summer weather the carcass spoils rapidly and may obscure whatever changes are present. Lay the bird on its back on a box, barrel, or kitchen table. With a sharp knife, disjoint the legs on either side and break them outward. Slip the tip of the knife under the skin at the point of the keel bone, sever, and turn it backward. Cut around the edge of the breast and after cutting through the bone, break it back toward the head. The bird is now opened and in position for examination. First, examine the liver for tuberculosis and then turn it over and look at the spleen. This organ is round, marble-shaped, and dark red in color. In tuberculosis it is often increased in size and may contain the typical tuberculous nodules or lumps as seen on the liver. Remove the intestines and scan the outer surface for nodules or wart-like growths of tuberculosis. This finished, open the bowel throughout its entire length with a pair of sharp scissors. This will show whether worms are the cause of the trouble. While on the intestines it might be well to

examine the cæcum. The cæcum is the appendix and is a two-pouched blind sac or gut located near the lower portion of the bowel. In coccidiosis this part of the intestines is often greatly enlarged and filled with bloody material. The blind gut is also a favorite place for blackhead to begin. In this disease the cæcum is much enlarged and filled with yellow cheesy material. The gizzard frequently contains many foreign bodies such as tacks, nails, glass, or short pieces of wire. The crop should not be forgotten because many young chicks and turkeys die from impaction or matting with balls of dry grasses. The head may show evidence of roup by the swelling of the eyelids. When these are glued together, a large quantity of pus may be found underneath. The jaws are split and the inside of the mouth, throat, and windpipe is examined for signs of canker or diphtheria. This should complete a good post-mortem examination. With the appearance of the insides of the birds well in mind, the owner may then read descriptions of some of the common diseases of fowls and have a reasonable chance of recognizing them.

It is customary to feed various poultry tonics to an ailing bird or a flock that has dropped in egg production. Some make a practice of feeding the laying flock cayenne pepper in the hope that it will increase egg laying. It is emphasized at this time that nothing will increase egg production other than proper housing and good feeding. Artificial stimulants are unnecessary and never advised. Money spent on such preparations is wasted.

Drugs and other chemicals are often put in the drinking water of chickens. This is usually done to control a certain disease or as a preventative. As a rule, the material dissolved in the water has an attractive color which adds nothing to its effectiveness. This type of medication is worthless in the control of tuberculosis, blackhead, roup, white diarrhea, fowl cholera, worms, coccidiosis, lice, or mites.

Many poultrymen use the term bowel trouble to describe a specific disease in their flocks. It should be understood

that bowel trouble is another name for diarrhea and is not a disease, but may be the leading symptom of tuberculosis, worms, fowl cholera, coccidiosis, and white diarrhea. Stress is sometimes placed on the color of the droppings. This means nothing because it is easy to influence the color of the droppings by the kind of feed given the flock. Except in the case of a red bloody diarrhea, the color is of no importance in determining the nature of the disease. The name white diarrhea, often applied to a common digestive disturbance of baby chicks, is very misleading, because many persons try to identify the disease by the presence or absence of white droppings. Often there is no diarrhea at all and even when present it is not necessarily white in color. A disease such as bacillary white diarrhea can only be identified by a laboratory examination.

AVIAN TUBERCULOSIS

Avian or chicken tuberculosis is a very common disease of poultry. It has been discovered that swine derive a large part of their infection with this disease from a tuberculous flock of chickens. Therefore, in order to control or stamp out the disease in swine, chickens must be freed also, or the pigs must be kept entirely apart from an infected flock of poultry.

Avian tuberculosis is often called going light, liver disease, consumption, bowel trouble, spotted or speckled liver, and rheumatism. The term, going light, is very descriptive because most of the badly diseased birds are very thin and light in weight. Bowel trouble refers to the chronic or persistent diarrhea which is observed in the later stages of the disease.

Cause of tuberculosis

Tuberculosis is a specific contagious disease of poultry and is caused by a germ which can be seen only with the aid of a microscope. It is frequently stated that intestinal worms will cause tuberculosis. This is not true because the

germ of the disease must be present. A heavy infestation with any of the common intestinal worms might so lower the vitality of the birds as to make them more susceptible to infection, but aside from this the worms have no bearing on the disease.

Tuberculosis is usually introduced into a healthy flock through the purchase of infected birds. The tuberculosis germ is easily destroyed by sunlight. This is one good reason for placing the chicken house in a sunny place, so that the adjoining yards may be disinfected by direct sunshine. Plowing will also help. The germs are passed from sick birds through the droppings. Birds seldom, if ever, cough or expectorate.

Symptoms of tuberculosis

While stress should be placed on the symptoms shown by tuberculous birds, a few common signs may help one to suspect the disease. In the beginning, birds appear sick and die at long intervals. The disease makes very slow progress at first and, for this reason, the appearance of a sick bird now and then does not arouse suspicion. The dead bird is usually cast aside without examination and it is not until the flock is badly diseased that the owner makes an investigation.

A few birds may be observed to become "droopy" and soon some of them develop a chronic diarrhea which causes the feathers about the vent to become soiled or matted. Some birds become thin and one or two may appear lame. The lameness is more likely to be caused by general weakness than an infection of the joints. Tuberculosis of the joints is sometimes recognized, but is far from common. If an ailing bird is picked up and examined, the flesh over the breast bone may be almost gone and nothing but the bare keel left. This thinness may occur in some other diseases besides tuberculosis. The comb and wattles are pale in color.

In most cases tuberculosis is confined to birds over six

months of age. Spring-hatched chicks do not usually show signs of the disease until late in the fall or winter. The losses during the winter months are frequently heavy. Close confinement and direct association with infected birds hasten the spread of the disease.

When birds over six months of age die every now and then, showing signs of extreme weakness, thinness, diarrhea, pale comb and wattles, and lameness, one may guess that the disease is tuberculosis. The next procedure will be to open one or two of the dead birds and examine the internal

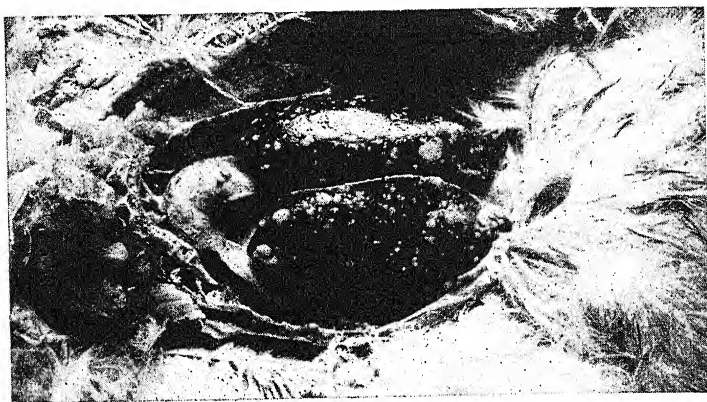


FIG. 44.—Tuberculous fowl. Note enlarged and spotted liver.

organs. The first organ that comes into view is the liver, located in the upper part of the abdominal cavity. In health the liver is dark red in color. When tuberculous it may be of the same color, but often greatly enlarged and covered with grayish or yellowish-white spots or nodules. These spots or lumps vary in size from the head of a pin to as large as a hickory-nut. The larger spots are slightly raised above the surface of the liver. When cut into with a sharp knife, the liver is found to contain many of these white areas. As the knife passes through one of these spots, a gritty sensation is felt. Most of the nodules are yellow

on the inside. When opened, the abdominal cavity of some diseased birds is found to be filled with a red watery fluid. This is blood and frequently comes from a ruptured spleen or liver (Fig. 44). If badly affected, both of these organs are very much enlarged and break easily. Jumping off a high roost might cause such an internal hemorrhage. The spleen is located directly under the liver. It is round and about the same color. The healthy spleen is about the size of a marble, but when affected with tuberculosis, it may be as large as an egg and covered with the grayish-white nodules. When sliced, the spleen may be found to contain the same spots on the inside. The intestines should be removed and the outer surface carefully examined for the presence of wart-like growths or tumors on the outside. These are grayish-white in color and, when split, have yellow centers. There may be only one or two of these lumps or there may be several dozen. Other parts of the bird, such as the lungs, joints and skin, may be affected, but the liver, spleen, and intestines will serve to identify the disease.

How tuberculosis spreads

Tuberculosis in chickens is a disease of the digestive tract, most of the germs being taken in through the mouth. Since the disease localizes in the liver, spleen, and the wall of the intestines, it is plain that most of the germs drain into the intestines and pass out with the droppings. Thus the floor of the poultry house carries a heavy load of infection. This is also true of the yards adjacent to the house. When open drinking and feeding dishes are used, the feed and water may become contaminated with droppings of many diseased birds. This would constitute an easy mode of infection.

Repeated investigations have shown that fowl tuberculosis does not spread to any extent through the eggs laid by infected hens. Birds become infected after they are hatched. Day-old chicks purchased from commercial hatcheries do

not spread the disease even though the eggs from which they were hatched came from a tuberculous flock or were laid by tuberculous hens. They might not be vigorous, but there would be no danger of their bringing tuberculosis into a healthy flock.

How to distinguish tuberculosis

Blackhead might be confused with tuberculosis. The former is a disease of turkeys, but may affect chickens when they are raised in close contact with a flock of turkeys. The lesions or changes found in blackhead are seen in the liver and blind gut or appendix. The blackhead liver may be covered with dark spots with greenish-yellow borders. When dug into with the finger or a stick, they are found to be mushy in character, much like an ulcer or abscess. The tuberculous spot is grayish or yellowish-white in color, hard, and grits when cut through. Blackhead does not affect the spleen, while tuberculosis does. Blackhead causes the blind gut to be greatly enlarged and filled with a yellow cheesy mass. In tuberculosis the blind gut is not affected. Blackhead does not produce any changes in the remainder of the intestine, while tuberculosis may show the typical warty growths mentioned.

To avoid confusion between these two diseases, the reader is cautioned to remember that blackhead is rare in chickens, while tuberculosis is very common. Tuberculosis may at times affect turkeys, but only rarely. A spotted liver in a turkey together with an enlarged and swollen blind gut would be almost sure to be blackhead. Also, blackhead affects birds as young as a week or ten days of age, while tuberculosis seldom occurs in birds under six months old. White cucumber-seed-like objects may be found under the skin of many of the older hens and it is often assumed that these are associated with tuberculosis (Fig. 45). The white seeds are all that is left of a mite which normally lives on the outside of the bird. This is not the common chicken mite, but a much rarer variety. Many of them burrow under the

skin and die. Nature then provides for their burial by covering the carcass of the dead mite with a hard gritty material. These seed-like burial places of the mites are harmless, except when present in unusually large numbers. The mites are never discovered until the bird is killed, dressed, and ready to be cooked. Most older fowl have

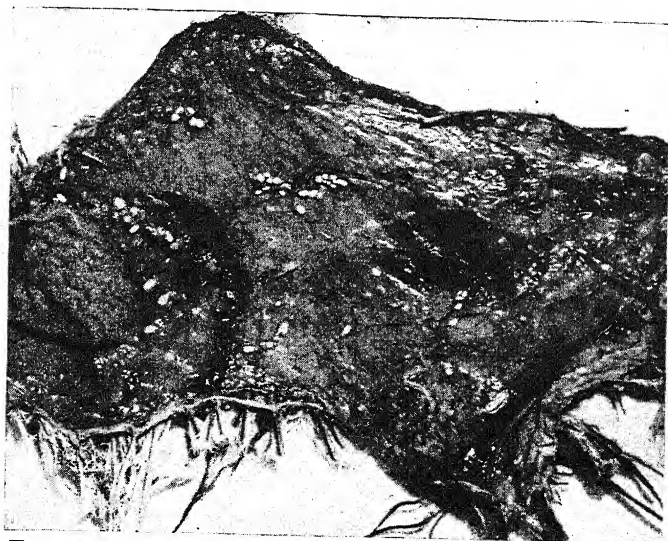


FIG. 45.—Under side of the skin of the breast showing the white seed-like connective tissue mites. They are harmless.

them, so they may be forgotten so far as the danger to human health is concerned.

Control and eradication of tuberculosis

It is useless to attempt the treatment of birds affected with tuberculosis. There are many remedies, but all are worthless. If a flock is infected, the owner should not look for a cure, but try to prevent the healthy birds from becoming infected.

There are four ways in which the disease may be controlled, if not entirely eradicated. First, if the flock is small and not of great value and if many birds have died, it would be best to destroy the entire flock and start over again the following spring with day-old chicks. The house in the meantime must be carefully cleaned and disinfected, and if possible moved some distance from the old grounds. Second, if the flock is large or valuable from a breeding standpoint, control may be attempted by means of the physical examination of each bird. This examination must be repeated at frequent intervals and an attempt made to select and discard all birds not in prime condition. In other words, careful culling should be practiced every two or three months. This method is not the best, but will serve to prevent heavy losses. It is hard work and there are many discouragements. Third, the tuberculin test may be applied to the entire flock and all reacting birds removed. This method is effective when close attention is paid to sanitation, for it would be useless to test a flock and remove the reactors if nothing was done to clean up the premises. It may require several tests before the flock is declared clean. Even then it might easily become re-infected if untested birds were introduced into the flock. Fourth, the owner of a tuberculous flock might test and rid himself of all the infected birds and then make it a practice to keep the hens for only one laying year. In this way he would never have a large number of old hens in the flock. Since the older birds are the ones usually found in the advanced stages, this should eliminate a large number of the spreaders of the disease. If the young growing flock is kept apart from the older birds during the summer and returned to the central house only after it has been disinfected and the older birds disposed of, the chances are that the losses from tuberculosis will not be great. This plan may not appeal to the grower of pedigreed stock, but it should not cause hardship to the average farmer, because it is well known

that pullets are the best layers. Most farm flocks have a large number of old hens that do not lay enough eggs to pay for the feed they consume. They are far better disposed of.

The question is often asked as to whether eggs from a tuberculous flock are fit for food. While the germs are sometimes present in eggs, this occurs very rarely. As a rule, badly diseased fowls are not heavy layers. Few eggs are eaten raw and the cooking process should destroy any germs which might be present. The same applies to the flesh of the fowl. If the bird is in good condition and the diseased organs are removed and destroyed, the flesh of the bird, if thoroughly cooked, should be edible.

The tuberculin test

The tuberculin test is a very accurate method to pick out the infected birds in the flock. The test is delicate and should be performed by a person skilled in its application. Unless a poultryman has had considerable practice in the use of a hypodermic syringe, the chances are that he will not be satisfied with the results of the test. This is commonly called the intra-dermal or skin test. It is performed in much the same way as the tuberculin test in cattle, except that the avian tuberculin is injected into the skin of the wattle. The liquid used in the test is made by growing the tuberculosis germ artificially in a special solution. When ready, the organisms are killed by boiling and filtered from the liquid. The remaining part of the solution is utilized to perform the test. This liquid could not cause tuberculosis because it contains no germs and is always sterilized by boiling.

When properly performed, the test is very valuable in picking out the infected birds. A small hypodermic syringe of about 1 cubic centimeter capacity and a 26-gauge needle are necessary. The important part of the procedure is the proper placing of the tuberculin in the skin. It should not be under the skin, but rather in it. Either the comb or

the wattle may be used (Fig. 46). The wattle is more easily handled. The point of the needle should be inserted as lightly as possible into the skin but not under it. Enough

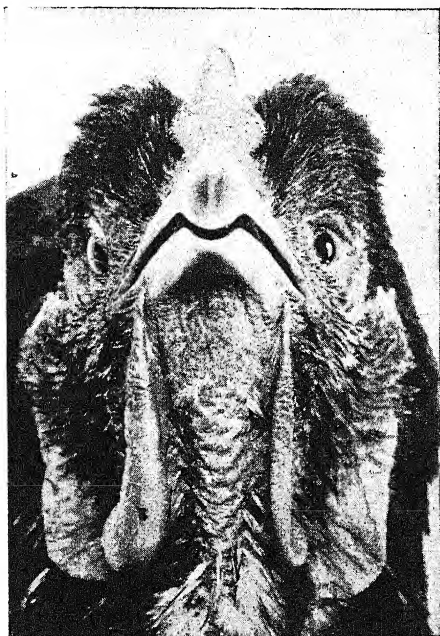


FIG. 46.—This bird reacted to the avian tuberculosis test. Note the swollen wattle to the left.

of the tuberculin should be forced in to produce an enlargement about the size of a small pea. Only one of the wattles is used, the other being left for comparison. If the bird is tuberculous, there will be a swelling at the point of injection of the tuberculin in forty-eight to seventy-two hours. The test is negative when the wattle has undergone no change and is the same as the wattle receiving no tuberculin. In reading the test it will be found that the increase in size of the wattle is due more

to a thickening than a definite round swelling. If applied and interpreted properly, this test is of very great value in the control of tuberculosis. The injection has no ill after effect on the birds.

COMMON COLD OR ROUP

Roup is a very common infectious disease of poultry. No specific germ has been identified as the one and only

cause, but germs are present and the disease spreads rapidly unless steps are taken to control it.

Crowding in poorly ventilated houses has a tendency to reduce the vitality of the flock and render them more susceptible to colds. This, together with insufficient or improper feeding, draughts, bad ventilation, and sanitation, often lowers the resistance of the birds, and colds result. The germs causing roup are ever present and it is only when the birds are weakened by mismanagement that the trouble appears. Roup is common during the spring, fall, and winter months, but may follow exposure to inclement weather at any other time of the year. Many farm chicken houses contain twice too many birds. Under such circumstances roup is frequent. A frosty ceiling that drips when the sun comes out in the middle of the day and wets the litter on the floor is a sure sign that the insulation and ventilation of the house are at fault. Roup seldom occurs when the proper number of birds is housed in a reasonably warm, dry, and well-ventilated building. The birds breathe the germs of common colds all the time and when in good trim are able to throw off the infection. When the vitality of the flock is lowered by any one or combination of more than one of the conditions mentioned, roup may appear.

Symptoms

Roup affects birds of all ages, but pullets are the chief sufferers. Chicks only a few weeks old may show signs of roup. When this occurs, the owner frequently refers to the disease as blindness and does not associate it with roup or colds of adult birds. Roup shows itself first as a slight cold in the head. The birds are noticed to sneeze and there is a watery discharge from the eyes and nose. The eyes of birds standing in the sun may be observed to glisten as the light strikes the head. Later on, the eyes may become glued shut and soon have a bulged appearance (Fig. 47). This is caused by the accumulation of pus underneath the lids. When the nose is squeezed, a yellowish mucous may

be forced from the nostrils. In some cases the nose is plugged and the bird has difficulty in breathing.

Together with the changes just described is the appearance of canker or cheesy yellow growths or patches on the inside of the mouth and over the windpipe. This condition is usually called canker or avian diphtheria. It is described



FIG. 47.—Bird with roup. Note the swollen eye. Such a bird is best destroyed.

as a distinct disease, but is frequently complicated with roup. A more complete discussion of canker will follow.

Treatment

An outbreak of roup is extremely difficult to handle after the disease has a good start. Even with the best housing, ventilation, and feed, a number of birds may die before the epidemic is over. As many as 400 birds have been known to die in a flock of 1,200.

An attempt should be made to ascertain the cause. If the ventilation is bad, it should be corrected before any

treatment can be expected to give results. A good test for a properly ventilated hen house is to examine the litter. If it stays dry after three or four days use in midwinter, the moisture is being taken care of satisfactorily. If the litter is wet and soggy, additional ventilation should be provided.

Since over-crowding is another common cause of roup, steps should be taken to reduce the number of birds in the building. If this is not done, nature in the guise of this disease will automatically decrease the numbers. A simple rule to follow is to allow 4 square feet of floor space for each bird. If the wind blows on the birds through cracks in the walls while they are on the roosts, they should be plugged. The diet should be changed if insufficient or if the wrong kind. Consultation with any farm advisor or the poultry department of any state agricultural college should enable one to remedy this fault.

If possible, all the sick birds should be removed to other quarters. This is sometimes impractical when large numbers are affected, and under such conditions they may be segregated in one end of the house and separated from the flock by a wire partition. This is not ideal sanitation or quarantine but will serve when other means are not available.

All the birds whose heads are badly disfigured should be killed. Hand treatment even in the beginning stages of the disease is time-consuming and often ineffective. It is sometimes suggested that the noses and eyes of the birds be irrigated with a boric acid solution. This frequently helps, but the owner may not find time to swab out the eyes and nose of each bird. If the number of birds affected is not great, this treatment may be tried. Should this fail, the use of a 10-per-cent solution of argyrol is suggested. This is a black liquid and may be secured from any drug-store. The nose should be swabbed with a match or toothpick tipped with absorbent cotton and dipped in the argyrol solution. Daily treatment is usually necessary to insure

any degree of success. The use of raw turpentine or kerosene in the eyes and nose of the birds is not recommended.

The eyes of some birds become glued together and must be pried open with the fingers. If this is not done, many will die of starvation. Birds with large bulging eyes are best destroyed. If treatment is attempted, it will be necessary to open the lids and press out the accumulations of dried cheesy pus. After this is done, argyrol may be dropped into the eye with a medicine dropper.

If the owner desires he may put some potassium permanganate in the drinking water. This is only a mild antiseptic and, while it may be helpful in keeping the water pure, it will have no bearing on the course of the disease.

Tonics are useless. In most treatises on chicken diseases a tonic is often suggested to be fed with the mash. Chickens do not require tonics. They need a well-balanced ration, housing in a commodious house, proper ventilation, and good care. If this had been given them, roup would not have appeared. In the absence of such conditions, it is difficult to understand how tonics of this sort can be of value.

CHICKEN-POX, CANKER, AND DIPHTHERIA

The names of canker, avian diphtheria, and chicken-pox are frequently given to a disease which affects birds in the form of yellow patches in the mouth or over the windpipe, scabs on the combs, wattles and skin, and the formation of cheesy material in and about the eyes. Chicken-pox, or scabs on the combs, wattles, and skin, is more common on the Pacific coast where great numbers of birds are raised in comparatively close confinement. The prevailing type is that which affects the inside of the mouth and throat. Some writers have described chicken-pox and avian diphtheria as distinct, but probably they are the same disease with different manifestations.

Canker and diphtheria are caused by a germ or, more

properly speaking, a virus. Faulty housing, sanitation, and feeding may render a flock more susceptible, but the disease cannot occur unless the virus is present. While an epidemic of this disease may happen at any time of the year, it is more frequent in the fall and winter months. During this time the flock is closely housed and the opportunities for the rapid spread of the infection are better.

Symptoms

Chicken-pox appears as small, dark, scabby, wart-like growths on the skin of the head or on the comb and wattles (Fig. 48). Baby chicks sometimes become affected and exhibit great uneven scabs which may entirely cover the eyes and nostrils.

Canker or diphtheria affects the corners of the jaws, the roof or floor of the mouth, and frequently extends down the throat into the windpipe. Casual examination of a bird's mouth may lead one to think the yellow patch in the corners of the jaws or in the mouth is due to the lodging of yellow corn. Such descriptions are very often given. The breath of the affected birds is foul and many rattle as they breathe. If the canker is located far down the throat, it may be overlooked easily unless the jaws are split and the windpipe opened with a knife or scissors. The characteristic foul odor together with the finding of the yellow masses in the mouth or throat should serve to identify canker. Canker is more frequent than chicken-pox (Fig. 49).



FIG. 48.—Bird affected with chicken-pox. The scab over the eye is hard and dry.

Treatment

Birds badly disfigured with either chicken-pox or canker should be destroyed. Even the most efficient form of treatment is very laborious and discouraging. This is a contagious disease and all the affected birds must be separated from the flock. The scabs may be scraped off with a sharp knife and painted with tincture of iodine. This must be repeated every day or two until recovery. The cheesy masses on the inside of the mouth and throat must be scraped loose and removed with a pair of forceps. After



FIG. 49.—Mass of yellow cheesy material adhering to the roof of the mouth. This is common canker or diphtheria.

the skin under the patch is cleaned, it should be painted with tincture of iodine. The patches and scabs may return again and again, but there is no other treatment except to remove them as fast as they re-appear.

Vaccination is of very little value in the treatment of sick birds. It should be considered a preventive rather than a curative agent. Some of the newer types of vaccines are sometimes very effective if used properly before the flock becomes infected.

After the removal of the sick birds, an attempt should be made to rid the premises of the virus of canker or chicken-

pox. All the nests, feeding utensils, and drinking fountains must be removed and carefully cleaned and disinfected. The old litter should be removed, the floor disinfected, and clean litter substituted. Medicine and ventilation will not prevent the healthy birds from being infected if virus is allowed to remain in the house. A careful examination of the flock should be made each day and any other birds that show signs of the disease removed. It requires a long time to bring this disease under control. Egg production is greatly decreased and the general health of the flock is at low ebb.

FOWL CHOLERA

This is one of the most fatal diseases of chickens. It moves very rapidly and it is not uncommon to hear of twenty-five birds dying in a single day or night. An outbreak of fowl cholera may occur in flocks which are in prime condition and laying heavily. Turkeys and geese also suffer from it and the losses are heavy, especially in a flock being fattened for market. It is natural to blame sudden deaths of this nature to spoiled feeds, the drinking of water with a green scum on it, or poisoning with malicious intent.

Cause

The cause of fowl cholera is a specific germ which is often present in the bodies of apparently healthy birds. In this respect it resembles the germ causing hemorrhagic septicemia of cattle, sheep, and hogs. When for some reason the vitality of the flock is lowered, the germ picks up in virulence or strength and is able to produce disease. Cholera is more frequent in the autumn and early winter when birds are being fed heavily for egg production or fattened for market. Large flocks of marketable geese and ducks held for shipment at assembly points appear very susceptible and many die when conditions are favorable for the germs to gain a foothold.

An over-fat condition, crowding into close quarters, and

undue exposure tend to make birds more susceptible to the disease. Cholera does not appear to be caused by poor feeding because those in the best condition often die first.

Symptoms

The first symptom is the sudden death of a number of birds. In most cases the observance of symptoms is out of the question, because a large part of the losses occur during the night. The period of sickness is so short as to make symptoms of very little value. When numbers of birds die for no apparent reason and without being noticeably ill beforehand, the poultryman should suspect fowl cholera. This should be verified by a laboratory diagnosis, because the germ causing cholera is in the circulating blood and is easy to identify under the microscope or by means of a bacteriological examination. First, tear the skin back over the breast muscles and note any change in the color of the meat. In a healthy bird the breast muscles are rather pale and more or less colorless, while those of a chicken recently dead of cholera are often very red with the blood-vessels standing out prominently. The breast of the bird is then cut and turned back over the head, leaving the internal organs exposed to view. Notice whether the heart appears very much inflamed. This is indicated by the engorged condition of the blood-vessels of the heart wall or muscle. The liver may be found to be over-large and very red in color. The intestines are examined next. Cholera often causes the blood-vessels in the wall of the intestines to stand out as though they were painted. The post-mortem, therefore, would show engorged blood-vessels of the heart and intestines, enlarged dark red liver, and pink or red breast muscles. The final diagnosis can only be made in a laboratory.

Treatment

No medicine is of any value in the control of fowl cholera. All efforts should be directed to keep the disease from spreading. Even this is very difficult. All sick birds

should be destroyed as soon as the disease has been identified positively. If possible, remove the flock to other temporary quarters and clean and disinfect the house. Clean and scald the drinking and feeding utensils. A mere scrubbing will not do. As flocks in the best condition are often the first to be attacked, it has been found beneficial to cut the feed ration in half. This alone has often stopped heavy losses. It is useless to vaccinate a flock against cholera. Strict sanitary measures only are of value in the control of this disease.

INFECTIOUS BRONCHITIS

The common names given this disease are Canadian flu and influenza. It is supposed to have entered the United States by way of Canada. This disease has probably existed for a long time, but remained unrecognized as a distinct infection until 1923. Previous to that time many outbreaks of infectious bronchitis no doubt passed for roup, as the symptoms are very much alike. The losses are heaviest in autumn when the flocks are first housed for the winter. It is doubtful whether this disease is widespread in farming districts, although occasional outbreaks have been reported. Most of the trouble has been in feeding stations where large numbers of birds were housed in batteries in very close quarters. Here they live a very unnatural existence and are force-fed in preparation for dressing. Truck-loads of birds are frequently hauled many miles in cold weather in the fall and finally reach a feeding plant where they are crowded into batteries. The exposure resulting from the journey and the close confinement appear to have a direct bearing on feeding-station outbreaks. Carlot shipments of live birds to far distant points during cold and rainy autumn weather often suffer severe losses.

Cause

Infectious bronchitis is contagious, although the identity of the specific causal germ remains unknown. Many different organisms or germs have been found in the air pas-

sages of sick birds, but no one has been settled on as the exact cause. The disease is doubtless brought on by exposure, especially when thousands of birds are assembled from hundreds of different farms under one roof and in extremely close confinement. In the autumn, also, many farmers cull their flocks in preparation for winter housing and usually only the poorest birds are culled.

Symptoms

The affected birds usually assume a squatting or sitting position and gasp for breath. With each gasp for air the head and neck are extended upward, as if to open the windpipe. This is usually accompanied by a rattling sound, as though the windpipe were partially obstructed with phlegm. After taking as full a breath as possible, the bird's head drops and hangs as though paralyzed, tucked in against the neck. The bird appears to sleep between breaths. As a rule, the eyes and nose show a discharge which often closes the nostrils and hinders normal breathing. The discharge from the eyes and nose, together with the difficulty in breathing, explain why this disease is so often confused with roup, especially the canker or diphtheritic form.

Infectious bronchitis begins abruptly and runs a very rapid course, the birds dying of suffocation within a few hours after the symptoms become pronounced.

The after-death examination shows nothing more than an intense inflammation of the respiratory tract. The head should be opened carefully and the windpipe dissected out. The inside of the windpipe or trachea may be found filled with a sticky stringy mass which is usually streaked with blood. Death is caused by suffocation. Mucous may be pressed from the eyes and nose.

Treatment

All infected birds should be placed by themselves. If the outbreak occurs in feeding establishments, the destruction of all those affected is advised because the treatment is tedious and the risk of further infection is too great. All

batteries should be steam-cleaned. This must include the troughs in which the feed is placed. As a further precautionary measure, it would be best to discontinue further feeding for some time and dress out all the birds on hand.

In an outbreak of the disease on the farm, the sick birds should be destroyed and the feed withheld or at least greatly reduced for at least forty-eight hours. Many different inhalations and injections have been suggested as a cure. None is described here because, for the most part, they are useless and only serve to prolong the disease on the premises. The flock owner who elects to destroy all sick birds as fast as they appear will make faster progress toward the control of the disease than one who persists in treating them. Careful disinfection of the house and feeding and drinking equipment should be undertaken at frequent intervals during the attack.

BACILLARY WHITE DIARRHEA

This is a very acute and fatal infectious disease of baby chicks. The name is unfortunate because the owner of sick chicks that die with symptoms of diarrhea is very likely to consider it as the infectious type of the disease. It is always well to keep in mind that all diarrheas of chicks are not of an infectious nature. Many are caused by faulty feeding and insanitary surroundings. Due to confusion in respect to diagnosis on the basis of a white diarrhea in the sick chicks, it is often difficult for a poultryman to acquire an understanding of this disease. Diarrhea is merely a symptom of a digestive disturbance and is not to be relied on in determining whether birds are suffering from the specific disease known as bacillary white diarrhea. A bacteriological examination of a dead chick is always necessary to identify this disease positively. Many chicks die of bacillary white diarrhea without showing any diarrhea at all. Also, the diarrhea is not necessarily white in color, although it frequently is. A diarrhea from faulty feeding, over-heating, or chilling is also likely to be white. It is an injustice to a commercial hatchery to assume that birds from such a

source died of this disease just because they happened to have a white discharge from the bowels. Mismanagement might easily have caused this.

Cause

True bacillary white diarrhea is caused by a specific germ. When this is found in dead birds, whether they showed a diarrhea or not, it is safe to declare the deaths were due to this cause. In order to make a positive diagnosis, it is necessary to send fresh specimens of the dead chicks, properly packed in sawdust and ice, to a bacteriological laboratory.

Symptoms

The actions of sick chicks are of very little value in determining bacillary white diarrhea. As a rule, the chicks begin to die within seventy-two hours after they are hatched. This disease seldom attacks a group of chicks after they are a month old. The birds look sick and frequently are pasted up behind. Most of the sick birds die after an illness of a few hours. The death rate may be from 30 to 90 per cent of the hatch. Some of the chicks may show a white discharge which sticks to the skin about the vent. A large number may have no diarrhea. Death apparently takes place before this symptom appears. The important fact to remember is that if large numbers of chicks die within the first few days after they are hatched, there is a chance that the trouble is caused by bacillary white diarrhea. It is impossible to identify this disease by a post-mortem examination of the insides of a dead chick. Some think the unabsorbed yolk-sac is a good indication of this disease, but this method of diagnosis cannot be depended on.

How the disease spreads

The germ of white diarrhea is discharged in large numbers in the droppings of a sick chick. When open drinking or feeding dishes are used, the water and feed may easily

become soiled with such infected droppings. Other healthy susceptible chicks partake of the polluted feed and water and quickly develop the disease.

Fortunately most infected chicks die, for those chicks that have the disease in a mild form and recover frequently act as carriers and live to lay infected eggs the following year. In old hens the germs become lodged in the ovaries where they live and serve to infect the forthcoming eggs. When such eggs are placed in an incubator, many of them hatch and the chicks are infected at birth. This is one of the very few diseases that may be considered inherited. The newly-hatched infected chicks soon become sick and the bowel discharges infect other birds. One-half dozen of such chicks may cause the loss of many more by the contamination of the brooder-house floor, feeding, or drinking utensils.

Treatment

There is no treatment for birds infected with this disease. The chicks have little or no resistance and quickly succumb to the infection. Many drugs and chemicals are offered to put in the drinking water, but their value is questionable.

When the first signs of trouble appear, all the sick birds should be destroyed or removed from the flock. It is sometimes suggested that the remaining healthy birds be kept in small groups, so that if the disease breaks out in one group it will not spread to another and thus help to reduce the losses. Whenever practical, this should be tried. If another brooder-house is available, the birds should be transferred while the first one is being cleansed and disinfected. All the drinking and feeding dishes should be cleaned and scalded very carefully. If desired, potassium permanganate may be put in the drinking water as an antiseptic, but not a cure. At best, control measures are often very unsatisfactory. The losses are heavy if the disease has been allowed to gain a foothold. The owner should resolve

to prevent a reoccurrence of the disease the following year.

To prevent or control bacillary white diarrhea, disinfect the incubator carefully with any household disinfectant. Pay special attention to the proper cleaning of the trays and nursery. After these are cleaned they should be placed in the sunshine for several hours. When eggs are purchased from another flock, it would be well to ascertain whether the disease existed on that farm the year before. It is often advised that the eggs be wiped with alcohol before they are placed in the incubator. Very little killing of germs is accomplished by this practice, but it is possible that some infection may be removed by the wiping.

If the owner values the health of his flock, he might attempt the removal of all the infected old hens by applying the agglutination test to all the layers. This test is performed in laboratories with special apparatus and cannot be undertaken at home. Blood samples are taken from the wing veins of all the laying hens. The wing vein is cut and the blood flows into tiny quarter-ounce vials. Each vial contains one blood sample appropriately labeled with the number of the bird which is leg-banded beforehand. The samples of blood are packed carefully and sent to a laboratory for testing. When the results of the test are reported, the owner will know which birds should be discarded from the flock. One test is not usually sufficient to rid the flock of all the infected hens. It may require several tests before this is accomplished. The test, properly performed and correctly read or interpreted, is an effective means of controlling this disease.

With the advent of commercial hatcheries, eggs are hatched by millions and distributed over a wide territory. Hatcheries with large capacities collect eggs far and wide and, while they take every possible precaution, it is reasonable to expect that many infected eggs are received. This method of hatching and distribution is, no doubt, responsible for the disease becoming widespread. Many small

hatcheries have attempted to have all the flocks supplying eggs to the hatchery blood-tested. This necessitates close supervision and is practical only in hatcheries of relatively small capacity. The proper supervision of the flocks that supply the hatchery, together with careful culling, will aid in the ultimate control of bacillary white diarrhea.

BLACKHEAD IN TURKEYS

This disease is widespread throughout the United States and is responsible for heavy losses each year. In some sections the raising of turkeys has been discontinued, because more died than reached the market. The name of the disease does not describe the trouble, because the heads of the turkeys do not become black. The color of the head has nothing whatever to do with this disease. The nature of blackhead is not well understood by most growers. The disease attacks turkeys of all ages, but the losses are usually heaviest when the birds are small. On this account it is commonly believed that poults are comparatively safe from disease after they shoot the red. Shooting the red is that period in a turkey's life when the head parts begin to turn red. It has no bearing on the likelihood of the birds escaping this or any other disease. Due to the inroads of blackhead, turkeys have the reputation of being very difficult to raise. When the facts are known, baby turkeys may be raised and fed in much the same way as baby chicks and are, if anything, stronger and more vigorous. A little dew on the grass is thought by many to be fatal, but this seldom causes losses unless the moisture is heavy enough actually to drown the birds. The real cause of 80 per cent of the losses from disease is blackhead.

Cause

Blackhead is a specific disease of turkeys. Poults may die as young as one month. A microscopic parasite is the exact cause. The disease affects the digestive organs of the turkey and innumerable parasites are passed off in the drop-

pings. It is very difficult to transmit the infection from an infected to a healthy bird by direct contact. Some process appears to be necessary before a healthy bird can become infected. The other factor which is necessary before the disease can spread is the tiny cæcal worm of chickens. This worm is very small, being seldom more than $\frac{1}{2}$ inch in length. So far as known, this worm does not cause serious trouble in either chickens or turkeys. It is present in the cæcum of the greater number of chickens raised on the farm.

When turkeys are raised on ground where poultry have ranged, they easily become infected with the cæcal worm. This worm enters the blind gut or appendix of the turkey and paves the way for the entrance of the blackhead parasite. The worms injure the lining of the inside of the cæcum and cause minute cuts or abrasions. If turkeys swallow blackhead parasites from the ground or in their food or water, these are carried into the intestines and eventually find their way into the cæcum. Here they enter the wall of the cæcum through the openings in the lining of the intestines made by the worms.

Two organisms, therefore, are necessary before blackhead can gain a foothold in a flock of turkeys, namely cæcal worms and the blackhead parasite. When both are present at the same time, birds quickly become infected. Methods of controlling this disease involve the raising of turkeys on ground free from chicken contamination. As a further illustration of the danger of mingling turkeys and chickens, it may be pointed out that blackhead may often be produced by feeding chicken droppings to young turkeys. After the disease becomes established in the blind gut, the parasites are carried to the liver by means of the blood-streams.

Symptoms of blackhead

The head does not turn black. The affected birds become gradually weaker until a diarrhea appears. This is often greenish-yellow in color. The birds stand in a humped posi-

tion and move slowly. They eat very little and die soon after they are observed to be ill. Some owners report that the flock may appear all right the night before while in the morning one or two turkeys may be dead. The post-mortem examination of the dead birds is far more important than the symptoms shown by the live sick ones.

Blackhead is a very easy disease to recognize. It is often

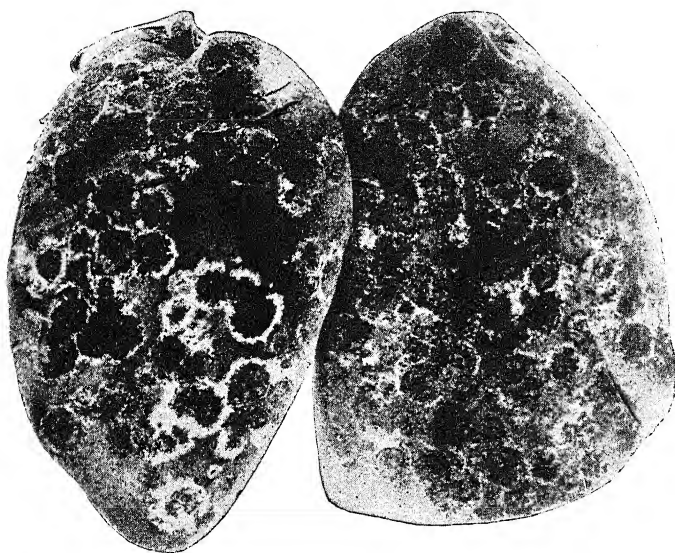


FIG. 50.—Typical blackhead liver. The spots are soft and mushy.

confused with tuberculosis, as both cause the formation of spots on the liver. These spots are very different in character. Blackhead attacks the cæcum first and then spreads from there to the liver, through the circulating blood. The cæcum is a two-pouched portion of the intestine. It is found near the end of the bowel and close to the rectum. When affected with blackhead, the blind gut is greatly enlarged and filled with a yellow cheesy mass. In long-

standing cases, ulcers may appear to eat their way through the covering of the cæcum. In poultz the cæcum may be as large as the little finger and the owner usually describes it as "rotten." The liver is the second place for the disease to locate and is found to contain spots of varying size scattered over the surface (Fig. 50). The spots or ulcers may have dark red or greenish centers with lighter yellowish rings about the outside. The appearance varies so much that a precise description may not cover all cases. As a rule, the spots are soft and mushy, somewhat like a rotten spot in an apple. They differ from the spots of tuberculosis, because they are very soft and do not have the characteristic hard, dry, yellow centers. The two typical changes found in the blind gut or cæcum and the liver should enable one to distinguish this disease. The spleen is not affected as in tuberculosis and the tuberculous wart-like growths are not found on the outside of the intestines.

How to prevent blackhead

There is no treatment or cure for this disease. Many are offered but their value has never been proved. Ordinarily it does the birds more harm than good to administer several drugs of questionable value, because the continued irritation of the intestinal tract may serve to aggravate the disease still further.

Comparative freedom from blackhead may be obtained if turkeys are raised on ground which has not been soiled by the droppings of chickens. Since turkeys are allowed to run at large on most farms, it is impossible to control their movements and the greater part of their time in the spring and fall is spent in and around the farm buildings. In the off-season when the birds are inclined to stray away, the losses are not as heavy.

The only way the movements of turkeys can be controlled is to confine the flock inside a fence or inclosure on ground far enough away from the farm buildings to be free from chicken droppings. It is necessary to place the yards

at least 200 yards from the farmstead. This plan has been followed on many farms for several years and found to be effective in controlling blackhead (Fig. 51).

If the turkeys are hatched in incubators and raised in brooder-houses, the plan is very simple. The brooder-house is hauled out onto a grassy pasture such as an alfalfa field. Here the birds are confined in yards where they may have



FIG. 51.—This large flock was raised in confinement in yards that were changed once each month.

access to green feed and plenty of direct sunshine. When they are eight or ten weeks old and the brooder-house is no longer necessary, the young flock is placed on what is often called a rearing ground. This, also, must be far enough from the farm buildings to be safe from chicken contamination. Care should be taken not to use a field that has been top-dressed with chicken manure. This rearing ground need not be larger than $\frac{1}{8}$ acre for 200 or 300

birds about two months old. A shelter is built for the birds and feed and drinking water is kept before them constantly. The yard is changed every three or four weeks or as soon as it becomes dirty. A five-foot fence is satisfactory to keep the birds inside. As the birds grow older, the size of the yard may be increased. The regular rotation of the growing flock on clean ground free from chicken contamination is certain to reduce the losses from blackhead to a minimum. No drugs are used, nothing but clean ground and rotation of yards. This plan of rotation and sanitation will also prevent the flock from becoming infested with worms and coccidiosis. These are soil-born diseases and are acquired by young turkeys when they run on the ground about the farm buildings where the adult flock of chickens has polluted the soil for a generation. It is impossible to control any disease under such circumstances.

If hens are used for hatching and brooding, considerable risk is involved, but this may be reduced by placing the hens and broods 200 yards from the buildings, in portable brooder coops. After the poults reach weaning age and the weather is favorable, they may be taken away from the hen mothers and placed in a yard of their own. This is provided with a shelter and changed at regular intervals.

COCCIDIOSIS

The occurrence of this destructive disease of young birds is increasing. Birds from four to eight or ten weeks of age suffer most. The disease derives its name from the parasite causing it. Turkeys as well as chickens may be infected.

Cause

Coccidiosis is caused by a minute parasite which lodges and multiplies in the intestinal tract of young birds. Older hens that have recovered from the disease may act as carriers and infect the soil. The parasites are picked up from the soil or from contaminated water and feed. They are carried down into the intestines and become established in



FIG. 52.—Birds suffering from coccidiosis. The sleepy attitude is characteristic. This drowsy position often leads one to believe the birds are blind. Some mistake this disease for white diarrhea. The birds in this picture are all about one month old. This fact alone would tend to make white diarrhea very unlikely. Rapid death, sleepy attitudes and diarrhea, bloody or not, of birds from four to eight weeks of age should make one suspicious of coccidiosis. This disease is pronounced as “cock-sid-e-o-sis.”

Coccidiosis is more often seen after the white diarrhea age and before the first appearance of worm infestation. It is frequently confused with either of these two diseases. Bear in mind that white diarrhea is a disease of very young chicks and is of bacterial or germ origin. Coccidiosis is caused by a parasite which lives in the soil and in the intestines of older carrier birds. There is only one safe way to prevent this trouble and that is a clean brooder-house placed on ground not soiled by chickens of previous years.

the cæcum or blind gut. Here they multiply and set up an inflammation which in turn causes bleeding of the lining of the bowel. The cæcum is the favorite seat of infection in very young chicks, but in older birds other parts of the intestines may become involved. Since there is no practical way to disinfect the soil, the old yards must be avoided as much as possible. Young birds affected with this disease pass millions of the parasites in their droppings and these become infective after a few days incubation in the soil.

Symptoms

The age of the affected birds is important, from four to eight weeks with variations (Fig. 52). The birds appear droopy for two or three days before they die. A bloody diarrhea is considered the outstanding symptom of coccidiosis, but this is not always observed in very acute cases. The birds are likely to be very thirsty. Given a history of many deaths in birds of the ages suggested and droppings discolored with blood, one may be justified in suspecting this disease.

A post-mortem examination will assist in the recognition of the disease. When the dead bird is opened, particular attention should be paid to the appearance of the cæcum or blind gut. This is the two-pouched organ in the lower part of the intestines. When affected with coccidiosis, the cæcum is very much enlarged and filled with a bloody mixture. Each sac of the cæcum may be as thick as the little finger and the outer surface much inflamed or reddened. Specimens of other dead birds may be sent to a bacteriological laboratory for microscopic examination and verification.

Treatment

First, all sick birds should be removed from the flock. If a brooder-house is used, it should be hauled onto new ground away from the old chicken yards. No medicine is of value. It is best to destroy all the sick birds because it is very doubtful whether they will recover. Besides, many of the

recovered birds may act as carriers to inaugurate the disease the following season. All dead birds should be burned or buried. If the remaining flock is allowed to run on the same ground it is unlikely that any progress can be made toward preventing infection.

After the brooder-house has been moved it should be cleaned and carefully disinfected. From this time on, the floor of the brooder-house should be cleaned daily and fresh litter provided. Scald all the drinking and feeding dishes frequently. Reduce feed to little or nothing and supply liberal quantities of soured butter-milk. A small amount of mash may be permitted, together with plenty of greens. Allow the birds to run outside, and change the yard about the brooder-house every three or four days.

If soured butter-milk is not available, a simple mash containing 40 per cent of dried milk may be substituted. No other feed except water and greens should be given. Continue this method of feeding until the losses stop. The ration may then be changed back gradually to the one fed before the disease began.

This method of feeding will help if the sanitary measures are not neglected, otherwise it is valueless. The daily cleaning of the floor is important, because the parasites as they pass from the infected intestines are not immediately dangerous. It takes about three days for the parasites to molt or hatch into the infective form. The daily cleaning of the house will remove the newly-passed parasites and prevent their incubation or hatching. The brooder-house should be moved every three or four days. If this outline is carefully followed, most outbreaks can be stamped out easily.

CHAPTER XX

PARASITES AND OTHER AILMENTS OF POULTRY

MANY farm flocks are infested with intestinal worms. The ones most often encountered are the round-worms, tape-worms, and cæcal worms. The first two cause the most damage. A heavy infestation of tiny cæcal worms may so lower the vitality of young chicks as to cause death, but it has not been demonstrated that these worms cause the death of adult fowls.

There is only one way to determine definitely whether a flock of chickens is infested with worms. This is to kill and examine a few birds suspected of being wormy. The worms in the intestines are big enough to be seen with the naked eye. It is commonly supposed that worms may be diagnosed in a flock by observing the symptoms shown by the sick birds. This may help to make a guess, but nothing more. A few of the birds may show symptoms of extreme weakness, lameness, and diarrhea, but this is not conclusive proof that they are wormy. A laying flock should never be treated unless they are known to be suffering from worms.

In examining dead birds the owner should remove the intestines and open them from end to end with a pair of sharp scissors. The finding of the worms in large numbers is conclusive proof that the flock is infested and should be treated. A number of thin, weak, or bedraggled birds in a flock may cause a suspicion of worms. The examination verifies the diagnosis.

ROUND-WORMS

These worms measure from 1 to 5 inches in length, are white in color, and have sharp-pointed ends. A few

do little harm, but when they are present in large numbers they may easily cause unthriftiness and the death of many birds. The deaths do not occur suddenly, but are distributed over a long period of time.

Many adult hens carry a few round-worms without being seriously harmed. Young birds under four months of age are very susceptible to round-worm infection. After they reach this age or older, they are comparatively immune to heavy infestation and are seldom troubled. Some investigators have stated that when birds reach the age of four months they are fifty times as resistant to worms as chicks two or three weeks old. For practical purposes the owner is reasonably sure of a worm-free flock if the young birds are raised on clean ground until they are four months old.

Life history

This worm, unlike many others, has a very simple and uncomplicated life history. The adult round-worm lives in the intestines. The female produces eggs which pass out with the droppings. After reaching the soil, the eggs must go through a period of incubation before they are able to infect another bird. Before incubation they are harmless. If the weather is favorable in respect to warmth and moisture, the eggs incubate successfully in about one week and tiny worms develop inside of the shells. Direct sunshine and long periods of dry weather are fatal to the development of round-worm eggs. When deposited in moist shady places, the eggs will remain alive for several months.

After the worms have developed inside the shell of the egg, they may remain in the soil until they are picked up by chickens. When swallowed they are carried into the gizzard, stomach, and intestines, where the outside covering of the eggs is dissolved, liberating the young worms. These little worms bury themselves in the wall of the intestine and after about three weeks seek the open intestine, becoming full grown in eight or ten weeks. This completes their life cycle.



FIG. 53.—Piece of chicken intestine showing a mass of round-worms. The intestine was opened with scissors.

Symptoms

Old birds may be affected, but chickens under four or five months suffer most. Older birds that become infected early in life and carry a heavy load of worms frequently become very thin and unthrifty. The younger birds sometimes become stunted and many show evidence of leg paralysis. The combs and wattles are often pale or enemic. Weakness and unthriftiness are the dominant symptoms. The post-mortem examination will show large numbers of roundworms in the intestines (Fig. 53).

Treatment

Flock treatment is not advised. This is frequently attempted by adding 1 pound of commercial tobacco dust to 50 pounds of a dry mash and feeding this over a period of two or three weeks. The disadvantage of this method lies in the fact that the weak or wormy birds fail to reach the hoppers and, therefore, receive very little of the treated mash. The dosage is very inaccurate and many birds doubtless eat

more than is good for them. In addition, the nicotine content of the dust is variable and, therefore, unreliable.

Repeated doses of Epsom salts, at the rate of 1 pound to each 100 birds, is said to be helpful. The salts are dissolved in the drinking water.

The commercial nicotine sulfate capsules will remove round-worms from chickens effectively. These are frequently sold under various trade names. This is an individual treatment and requires that each bird receive one capsule. Care must be exercised to make sure the capsule slips down the throat. To aid swallowing, the capsule may be dipped in olive or castor oil just before it is placed in the back of the mouth. The birds should not be starved before this treatment is given. Young chicks that are very weak may die; these should be given half the usual amount by opening a capsule and removing half of its contents. The full capsule is safe for birds over ten weeks of age. All worm expellers are poisons, otherwise they would not kill the worms. They must be used with the understanding that the very sick birds may be killed by the treatment. Turkeys more than two months of age may be given the same dose. Capsules containing both nicotine sulfate and kamala are offered to expel round-worms and tape-worms at the same time. The value of either of these drugs is greatly reduced when used together and should not be given unless the flock is heavily infested with both varieties of worms.

After treatment, the floor and dropping boards should be carefully cleaned and disinfected and, if possible, the runs about the hen house plowed up. The flock should be kept from wet shady groves, because the infection in such places is often very heavy.

TAPE-WORMS

The adult or full-grown tape-worm is flat, white, and made up of joints or segments. Some of the largest worms

may be several inches in length. The worm is equipped with teeth by which it is attached to the inside wall of the intestines. The worms are very thin and often appear as a mass of tangled white threads obstructing the passage through the bowel. When the worms, or a portion of the intestines to which the worms are attached, is placed in a dish of warm water the worms float out in such a way that the segments or joints are easily detected. There are many different species of tape-worms, but the one usually encountered is described here.

Life history of the tape-worm

The adult tape-worm attaches itself to the lining of the intestine and grows from the head outward. As the segments or links near the tail end of the worm become mature, they drop off. Each joint or segment as it is sloughed off contains innumerable eggs. The segments mix with the food in the intestines and pass out in the droppings. If these segments are immediately eaten by another fowl, they do not grow to maturity. The eggs contained in the segments must go through another stage of development or incubation before they are able to produce tape-worm disease in another bird. In other words, an intermediate host is necessary before the eggs reach the infective stage. Depending on the species of tape-worm, this intermediate stage takes place in the common house-fly, stable-fly, snail, earth-worm or slug. Three or four of the common chicken tape-worms pass through the body of the house-fly.

The house-fly picks up the newly passed tape-worm segments from the droppings of an infected chicken. These are swallowed by the fly and are carried into its intestine. While inside of the fly, the eggs hatch and develop into the larval stage. When the time is ripe, the fly carrying the growing tape-worms in its body may be eaten by a young chicken. The fly passes into the stomach of the chicken where the body of the fly is digested or dissolved and the young tape-worms are soon liberated. At this time the tape-

worms are all head. These heads hook on to the wall of the intestine and proceed to develop segments from behind the head outward. From then on another life cycle is started.

Symptoms of tape-worm infestation

Birds carrying tape-worms act the same as those infested with round-worms. There is usually weakness and unthriftiness which may continue until the birds are paralyzed. Paleness of comb and wattles is a common symptom. Birds of all ages may harbor tape-worms, but the losses are greatest in young ones. Sometimes the poultryman may notice the white segments as they pass in the fresh droppings.

When the birds are opened after death, the worms are found clinging to the wall of the intestine. One or two worms may not cause trouble, but when present in large numbers they may be considered the cause of the disease. The tape-worm is very fragile and breaks easily.

Treatment

The best and simplest treatment for tape-worms is the use of kamala. This drug is made up in one-gram capsules or tablets. While one gram is the customary dose, this amount should not be given to birds less than half grown. When administered to birds only a few weeks old, the death of many may follow. The birds should not be fasted before treatment. This drug is sometimes very poisonous to turkeys, especially to young poults. It is also dangerous to use when the intestines are empty. Birds badly emaciated or weakened from this disease have little vitality and may succumb to any treatment. A safety precaution would be to try the one-gram dose on several birds soon after they have been fed. If one or two die, the dose should be reduced about one-half. Birds in good flesh and of proper age are seldom disturbed by the treatment.

The fact that it is dangerous to treat very young chickens and turkeys is unfortunate, because heavy losses are some-

times sustained before the birds are old enough to be wormed safely. The moral of this is to rear the young birds at some distance from the old infected yards.

CÆCAL WORMS

These worms are almost always found in the blind gut or cæcum of fowls. The blind gut is an appendix-like organ in the lower part of the intestine. It is made up of two pouches which are attached to either side of the intestine a short distance from the rectum. Both of these pouches open into the intestine.

Cæcal worms are tiny thread-like white worms which are seldom more than $\frac{1}{2}$ inch in length. So far as known, they do not harm chickens but may aid in the transmission of blackhead in turkeys. The cæcal worm injures the lining membrane of the cæcum and opens the way for the black-head parasite to enter and multiply.

The cæcal worm has a life history very much like that of the common round-worm. The adult lays the eggs in the intestine. These pass out in the droppings, incubate in the soil, and after a few days are ready to infect other birds. The eggs must go through the incubation period before they are able to infect another chicken. Before this time they may be eaten without danger.

Several drugs have been suggested to expel cæcal worms. None has proved to be effective. Inasmuch as these worms seldom cause the death of chickens, one need not be greatly concerned if a few are found in the cæcum. It is claimed that blackhead can be controlled by the removal of the cæcal worm, but the location of this worm makes this practically impossible. The use of nicotine sulfate capsules and kamala is not advised for the expulsion of these worms. If something must be done, tobacco dust as suggested for the flock treatment of round-worms may be tried.

GAPE-WORMS

This pest has been common in the eastern part of the United States but is seldom encountered elsewhere. The small

worm attaches itself to the inside of the windpipe of small chicks and so interferes with breathing as to cause death from suffocation. When older hens become infected, the worms stay in the trachea or windpipe only a short time.

Turkeys are considered the natural hosts or carriers of adult gape-worms, but are not greatly inconvenienced by their presence. Their part in the spread of the disease is confined to a distribution of the worms or their eggs in the soil. Other investigations have shown that the earthworm may at times play a part in the transmission of gape-worms. The eggs of the gape-worm may incubate in the soil and be taken directly into the digestive tract of a young chicken without passage through an earthworm. Since older hens seldom act as spreaders and earthworms play a minor rôle in the transmission of gape-worms, it would appear that turkeys are the chief source of infection to young chickens. To avoid infection with this parasite, chicks must be raised on ground free from infection and kept from associating with turkeys.

If the young flock of chickens is raised in brooder-houses on clean ground far from the yards about the farm buildings where both chickens and turkeys run, the losses from gape-worms will be very slight.

The symptoms of gapes are not complicated. The sick birds gasp for breath and will suffocate if the worms are numerous enough to cause a stoppage of the windpipe. Many farmers attribute the losses of young birds to this disease, because some are seen to gasp for breath. This alone does not indicate gapes. The finding of the worms, which are red in color and sometimes an inch long, adhering to the inside of the windpipe is conclusive proof.

It has been suggested that the worms be extracted with a feather or loop or horse-hair introduced into the windpipe. By twisting either of these, some of the worms may be extracted. When many birds are affected, the treatment is very tiresome.

LICE

The common body louse is so named because it spends its entire life on the body of a fowl. It is found more often on the sparsely feathered parts of the body, the favorite location being below the vent. The body louse is large enough to be seen easily with the naked eye. It is usually yellow in color. Chickens suffer from many varieties of lice, but this causes more trouble than all the others combined. This louse does not suck blood, but feeds on the scales from the skin and causes irritation by the bite it inflicts.

Body lice are both male and female. The female produces eggs and sticks them near the base of the feathers. Large masses of eggs are frequently observed where the feather emerges from the shaft. When young birds are attacked, the eggs are often deposited on the feathers near the head and neck. The eggs hatch in about a week and the lice become mature in another three weeks or less. Since lice breed very fast, it does not take long before a bird may become heavily infested. When the birds are closely housed, lice spread through the flock by direct contact.

How to rid a flock of lice

Lice are unnecessary. There are hundreds of louse eradicators, but the one that has stood the test of time and trial is sodium fluoride. This is a white powder which may be secured from any drug-store. It is cheap and far more effective than any of the other agents commonly used.

Sodium fluoride may be purchased in two forms, commercial or chemically pure. The commercial is the cheapest and best. The powder is not poisonous unless used in food by mistake. When it is applied, small amounts may be breathed which sometimes causes a mild irritation of the nose and throat. Too much, of course, might prove harmful. Under ordinary circumstances no danger will come from the use of this treatment if simple precautions are taken. The best time of the year to treat a flock is in the

late summer or early fall, before the birds are housed for the winter. At this time dipping may be practiced without danger of chilling the birds. It is also very important that the flock be deloused in the early spring, so that the young chicks will not be infected soon after they are hatched. If the work is well done at both seasons of the year, there is no reason why a flock should not be kept entirely free from lice. At the same time the treatment is applied, the chicken house should receive a thorough house cleaning and be treated for mites also.

Sodium fluoride may be applied directly to the skin of the birds by the so-called pinch method or the entire flock may be dipped in a solution containing this chemical. The dip method is very practical for large commercial flocks. The pinch method is the one in general farm use and removes lice fully as well when correctly applied.

Dipping should be practiced in warm weather. If the birds are dipped in the middle of the afternoon when the sun is shining, they will have dried out sufficiently by the time they are housed for the night. Birds should never be dipped when the weather is cold or when they are housed. A wooden tub is best but a metal one may be used if it is emptied immediately after the birds are treated. Otherwise the solution will corrode the metal. Measure the lukewarm water as it is placed in the tub and dissolve $\frac{3}{4}$ ounce of commercial sodium fluoride to each gallon of water. Grasp the bird about the wings with the left hand and hold it under the water up to its head. With the right hand, reach under the water and ruffle the feathers over the body so that the solution touches all the feathers. Duck the head of the bird, lift it out to drain, and the dip bath is complete. The entire process should take only a fraction of a minute.

By the pinch method the powder is applied in daubs among the feathers and on the skin in several places on the body. The birds are corralled in some convenient corner and an assistant is secured to catch them. One person may

hold and dust the birds. Each is held with the left hand by grasping it about the wings and dusted with the other. A convenient table or barrel head will serve to lay the birds on. A pinch of the powder is rubbed among the feathers of the head, back, breast, thighs, vent, and under each wing. The powder is sometimes applied with a shaker-top can, but this is not considered as effective, besides being wasteful. When chicks are treated, only two small pinches should be rubbed into the feathers, one on the back and the other about the breast and vent.

Dipping will kill the lice more quickly. The pinch method requires three or four days to destroy all the lice. In either method, enough of the chemical remains on the birds to kill all the lice that hatch from eggs after the treatment. Sodium fluoride is also effective to remove and kill all other varieties of lice. Other treatments will kill lice, but this is the standard.

Other varieties of lice

The head louse is about 1/10 inch in length and is common about the head and neck of young birds. These lice lay eggs and develop in much the same manner as body lice, reaching maturity in about three and one-half weeks. Mature fowls may be bothered by these lice, but most of the damage is to chicks. Sodium fluoride will eradicate head lice.

Many other kinds of lice may be observed in different sections of the country. Among these might be mentioned the shaft louse, the wing louse, fluff louse, large hen louse, brown chicken louse, and many others. All are effectively controlled by the proper application of sodium fluoride as described for body lice.

MITES

The common red mite is really gray and only becomes red after it sucks the blood of a chicken. It derives all its nourishment by digging into the skin and sucking blood.

The mite differs from an ordinary body louse in that it does not spend its entire life on the body of the bird it infests. During the day the mites live in the cracks and crevices of the hen house, coming out to attack the birds after sunset. The mites worry poultry at night and retire at daybreak while the lice arouse themselves to begin operations during the daylight hours.

A flock housed in a building heavily infested with mites is never in good condition. Egg production decreases and even laying or setting hens have been killed outright on the nests. When a flock is in a weakened condition from mites, the birds fall easier prey to any other disease to which they may be exposed.

Life history of the mite

The mature mite feeds on the blood of a chicken and, when satisfied, retires to some nearby crack or crevice and lays five or six white eggs. These are big enough to be seen with the naked eye and are frequently referred to as salt and pepper marks. After laying, the female again visits the same or another chicken, feeds again, retires and lays another batch of eggs. This alternate feeding and laying program is continued until the old female mite has produced about three dozen eggs.

During warm summer weather the eggs hatch in a day or two and, after passing through molting stages, become fully developed mites in one week. This would indicate that when everything goes smoothly a new crop of mites comes into existence once a week. When deprived of chickens to feed on, mites will live for several months in an empty hen house. Warmth and moisture help to keep them alive longer.

Treatment

Mites may be eradicated easily if the hen house is given a thorough cleaning and spraying. First, remove all the furniture such as roosts (if movable), dropping boards,

nests, and other utensils. The litter should be removed and burned. Scrape the floors and other places encrusted with dirt or filth. It is always best to apply this method of treatment in the fall before the birds are housed for the winter.

The most effective way to kill mites is to spray the house with commercial carbolineum. This is an oil which was originally designed for a wood preservative. It has since been found to be a very excellent mite killer. This is much better than kerosene, carbolic acid, or whitewash. Kerosene evaporates quickly and soon loses its killing power. The use of watery solutions like carbolic acid is a waste of time. Carbolineum is a very penetrating oil and remains for months in the wood. Crude petroleum or waste crank-case oil from an automobile is next best. Carbolineum, crude petroleum, or crank-case oil pass through a sprayer better when mixed with kerosene in the proportion of 1 quart of kerosene to 3 quarts of the oil. A thorough application of any of these oils in the spring and fall will keep a hen house free from mites the year around. The birds should not remain in the house while the interior is being treated. The odor of the oil is irritating and the building should be aired out well before the flock is returned. Hit or miss spraying is never effective; spray the entire interior, floors especially. The furniture removed from the house should be carefully treated before it is replaced.

The feather mite

This is not as prevalent as the common mite. It looks very much like the red mite, but its habits are quite different. English sparrows are supposed to be the hosts or carriers of this mite. Red mites divide their time between the cracks of the hen house and the body of the chickens, while feather mites spend all their lives on the birds. The eggs are attached to the feathers where they hatch and later develop. The feathers about the vent are a favorite place for these mites. They, also, are blood-suckers.

In warm weather a flock infested with feather mites may

be dipped in a solution composed of 1 gallon of water, 2 ounces of flowers of sulfur, and 1 ounce of soap. All ingredients should be mixed thoroughly and stirred continually while the birds are being dipped. Submerge the bird up to its head, ruffle the feathers under the solution, dip the head, and quickly remove the bird from the bath. This treatment should be applied early enough in the afternoon so the birds will be dry before they go to roost. In cold weather the flock may be dusted with flowers of sulfur in much the same way as the pinch method is used for body lice.

All litter should be removed from the house and burned. Treat the interior of the house with carbolineum or crude petroleum as directed for red mites. Tear down and destroy all nests of sparrows.

Scaly-leg mite

This is essentially a mange mite of poultry. It affects the feet and legs chiefly, but may at times affect the comb. Scaly-leg is a contagious disease, being usually transmitted from one bird to another by contact with infected litter. The mites are very small and cannot be seen with the naked eye. They burrow underneath the scales of the feet and legs and, when numerous, force the scales outward, giving the feet and legs a crusted appearance (Fig. 54).

If the first hen noticed to be affected with this disease is of little value, it should be destroyed. The food value of the bird is not affected. The simplest home remedy for scaly-leg is dipping the feet and legs in pure crude petroleum. One or two treatments at intervals of two or three weeks may be necessary to effect a cure. If the disease is general in the flock, the house should receive a thorough cleaning and disinfecting. Remove and burn all the litter. Paint the roosts with carbolineum or crude petroleum.

THE FOWL TICK

These ticks are common in the southern states, but are

seldom observed in cold climates. Their habits are much the same as common red mites, as they feed during the night

and adjourn to the cracks and crevices of the building during the day. The adult tick is egg-shaped, somewhat less than $\frac{1}{4}$ inch in length and dark brown in color. It secures its nourishment by sucking the blood of the chickens. Due to the fact that the ticks may suck much blood from a bird, considerable damage is done to the flock. Fowl ticks are very long-lived, some living as long as two years without food. While chickens are the chief sufferers from this variety of tick, ducks, geese, turkeys, and other birds may be affected.

The full-grown ticks live in the cracks of the building, roofs, dropping boards, and other

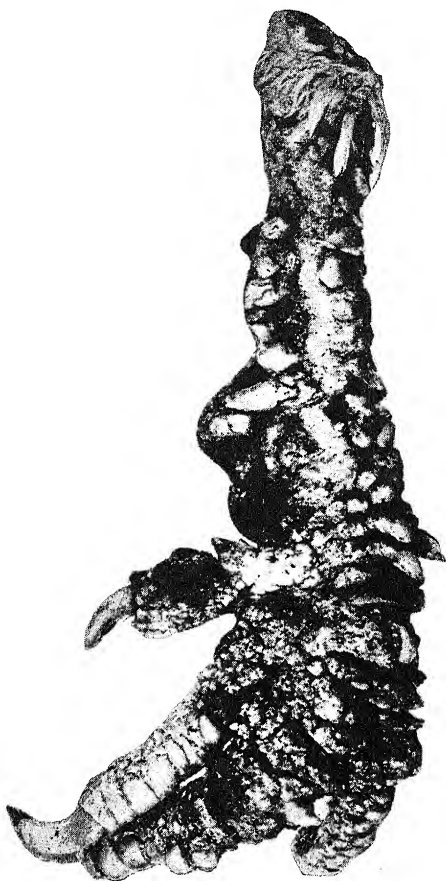


FIG. 54.—Foot affected with scaly-leg.
Crude oil will cure this.

places. Here the females lay their eggs. With favorable weather, the eggs hatch in about two weeks. The

young ticks are gray in color. Soon after hatching they crawl from their hiding places and in the night attach themselves to the skin of chickens. They are often seen in great numbers on the breast and under the wings where they attach themselves to suck blood. The ticks remain here for several days during which time they increase in size and turn dark red or blue. When full of blood, they loosen their hold on the skin, leave the birds, and hide in cracks or crevices. From then on the ticks pass through several alternate molting and feeding stages, increasing in size as they develop. All of their feeding is done at night. When full-grown, the female tick sometimes lays several hundred eggs.

How to rid a flock of ticks

The entire flock should be removed to another house or to temporary coops. If the infested house is not especially desirable, the best way to kill the ticks would be to burn it. After the flock is removed, it should be quarantined for at least ten days. This will allow time enough for all the young ticks which are already on the bodies of the chickens to become filled with blood and drop off. In the meantime the old hen house should be carefully cleaned and disinfected. Remove all movable furniture and litter. Tear out the old roosts and dropping boards. When everything has been scraped and cleaned, the entire inside of the house should be thoroughly soaked with carbolineum or crude petroleum. Do not replace dropping boards. Provide roosts suspended by wires from the ceiling of the house and stayed crosswise to prevent swaying. This will serve to prevent the ticks from finding cracks in which to hide.

The temporary quarters will now have to be cleaned and disinfected the same as the old house. It would be better to quarantine the flock in coops which could be burned afterward. All new additions to the flock should be examined carefully for young ticks attached to the skin

and then quarantined for ten days before they are placed with the flock.

LEG-WEAKNESS OF CHICKS

This is one of the commonest complaints of poultry. It is encountered during the early spring and summer months and frequently causes the loss or crippling of a large number of birds. Leg-weakness does not refer to chicks born with weak sprawling legs, but to those birds that develop the weakness some days after they are hatched. Weak-legged birds are frequently hatched, but this is probably due to inherent weakness in the breeding stock or some fault in the hatching process.

In some instances leg-weakness is caused by an unbalanced ration or one which is very low in mineral content and by a scarcity of green stuffs. The addition of precipitated calcium phosphate to the mash will help to overcome the mineral shortage. This substance should be used in addition to common minerals such as oyster-shells. Precipitated calcium phosphate may be obtained from a drug-store.

In very early hatched chicks the lack of exposure to direct sunshine is the usual cause of leg-weakness. Various types of glass substitutes are used to let in the rays of the sun, but at best these are of little value. The birds should be outside on grass. When the weather makes this impossible, cod-liver oil may be used instead. This will prevent the birds from becoming affected with the disease for a few weeks. If deprived of sunshine for long periods of time, even cod-liver oil may fail to keep the birds healthy.

The oil is mixed with the mash at the rate of 1 quart of cod-liver oil to 100 pounds of the mash. Mix the oil with about a peck of the mash and then incorporate this with the remainder. If this is not done it is difficult to distribute the oil throughout the mash.

FEATHER-EATING, EGG-EATING, AND CANNIBALISM

These are bad habits and if individual birds become chronic offenders they should be killed. The habit itself is not harmful to the individual, but it is very annoying to the owner and may be fatal to other birds. When a feather-eater is first noticed, it should be destroyed at once to prevent others from learning the habit. Close confinement, lack of exercise, and too little variety of feed may be the cause. It is said that exhibition birds suffer most. A shortage of minerals in the diet may be another predisposing cause. Treatment is seldom effective after the habit is firmly established.

Comb-picking is another vicious trait. It may begin when the comb is injured by accident. Blood flows and this attracts the attention of other birds. After tasting blood, the attacking birds seem to crave more. Soon the injured fowl becomes the center of attraction for a dozen or more which pick the bleeding comb continually. Unless the injured bird is removed, the comb may be eaten off and the bird killed. The time to act is when the chicken is first noticed to be bleeding. The bad habit of picking one another is often shown by young chicks. It is thought that the lack of animal protein, such as tankage or meat scrap, may encourage the habit, but the natural instinct of birds to attack the weaker members of the flock appears to be the real cause.

The egg-eating habit may begin when eggs are accidentally broken and left in the nests, on the floor of the house, or in the yards. In this way a taste for raw eggs is acquired and many hens may become addicts to this habit, eating their own and the eggs of others. The habit once firmly fixed, is almost impossible to overcome. The feeding of oyster-shells in liberal quantities is said to be of value. To prevent the trouble, dark nests should be provided and all broken or cracked eggs removed as soon as they are noticed. It is also good practice to gather the eggs at least twice a day.

CROP-BOUND

Occasionally a bird will overload the crop with dry grasses or mixtures of grass and dry grain to such an extent that the crop becomes greatly distended. All movement of the crop stops and soon the bird refuses to eat. If allowed to remain, this stagnant material will become foul-smelling and later cause an inflammation of the crop and the skin adjoining it. Sometimes the entire area about the crop becomes a diseased decaying mass which results in the death of the bird.

If noticed early, the crop may be massaged and, if water is introduced through the mouth, the contents may sometimes be loosened so that they pass off naturally. This method is not usually a success if the impaction has existed very long, because the crop becomes paralyzed and unable to perform its normal functions. When massage is not effective, the crop should be opened and the impacted mass removed with a spoon or button-hook. A pair of sharp scissors will serve for the instrument to cut through the skin. Remove a few of the feathers where the distention is greatest and cut through the skin directly into the crop. After the crop has been emptied, it may be washed out with warm water and sewed back into place. When sewing up the crop, be careful to bring the cut edges of the crop wall and outer skin tightly together. The edges of the outer skin should not be turned under. Silk or linen thread will do for sewing. The operation is very simple and, if carefully done, is usually successful. After the operation, the bird should receive very small quantities of soft food for several days.

CONSTIPATION

This trouble is not serious, but is frequent in flocks which do not have access to greens or succulent roughages. It may also be brought on by too heavy grain feeding and lack of sufficient exercise. It is easily remedied by the administration of 1 pound of Epsom salts in the drinking

water. If all water is taken from the flock late in the afternoon and the salts given early in the morning, the birds usually drink freely. As routine treatment, a mild laxative of this sort may be given the flock at intervals of one month during the winter. When used for the relief of constipation, 1 pound of Epsom salts will be sufficient for about 200 birds. Other liquids should not be fed while the Epsom salt water is before the flock.

PROLAPSE OF THE OVIDUCT

This condition is frequently observed in pullets that are being pushed for early egg production. It is easily recognized by the sight of a raw bleeding mass protruding from the vent (Fig. 55).

If the bird is not treated immediately other birds will attack it and actually devour the prolapsed portion of the oviduct. The bird should either be destroyed or removed from the flock for treatment. If permitted to remain with the flock, it may start an epidemic of cannibalism which will be very difficult to check. The protruded part of the oviduct should be washed and greased with any mild oil such as olive or salad oil. It is then gently pressed back into place. The bird must be fed lightly for a few days and brought back into production gradually. If the oviduct refuses to stay in place after a few trials, the bird should be destroyed. An epidemic of



FIG. 55.—A bad case of prolapse of the oviduct.

this trouble is sometimes seen in a young flock and the feed must be immediately reduced. Further heavy feeding will aggravate the disease.

BUMBLEFOOT

This is a swelling on the bottom of the foot and may resemble a corn or abscess (Fig. 56). The cause is an injury of some sort to the sole of the foot. This allows germs to enter to cause infection and abscess formation.

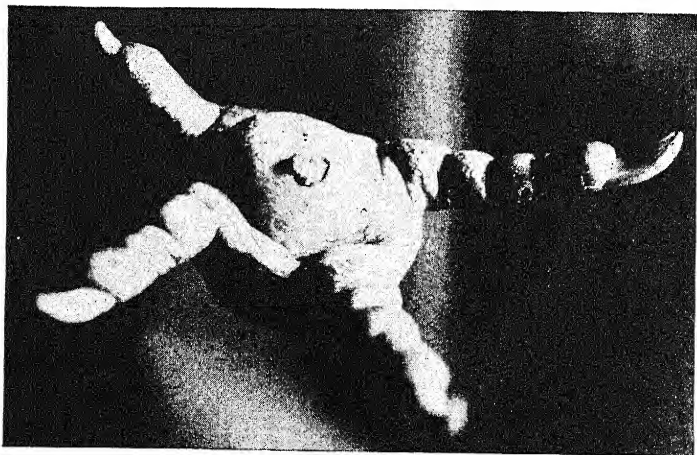


FIG. 56.—Foot of a bird affected with bumblefoot. Note central corn or core.

High perches and rough cement floors are sometimes blamed. The abscess or swelling soon comes to a head, at which time it should be opened with the sharp point of a knife and the pus removed. When opened, the material inside of the swelling may appear as a dry yellow mass. This must be dug out and cavity swabbed with tincture of iodine.

MINERAL FEEDING

Minerals in the form of oyster-shells and grit should be

part of the diet of all well-fed flocks. Special mineral mixtures are prepared for chickens which doubtless serve the same purpose. Mineral feeding should not be expected to increase egg production. At times a shortage of this element in the diet of young birds may cause leg-weakness. The prevalence of soft-shelled eggs is greatly reduced when the proper amount of mineral matter is consumed. This applies especially to pullets. The laying of soft-shelled eggs will not stop immediately after a mineral is placed before the birds. It may require several days or weeks before the flock is back in normal condition. Mineral feeding will not prevent worms or any other contagious disease of chickens.



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